

State of New Hampshire

GENERAL COURT
CONCORD

MEMORANDUM

DATE: November 2008

TO: Honorable John H. Lynch, Governor
Honorable Terie Norelli, Speaker of the House
Honorable Sylvia B. Larsen, President of the Senate
Honorable Karen O. Wadsworth, House Clerk
Tammy L. Wright, Senate Clerk
Michael York, State Librarian

FROM: Rep. Thomas R. Fargo, Co-Chairman
Dr. Ken Baldwin, UNH, Co-Chairman

SUBJECT: Final Report on HB 694, Chapter Law 222.1, Laws of 2007

Pursuant to Chapter 222.1, Laws of 2007, enclosed please find the Final Report of the Commission to Study the Feasibility of Tidal Power Generation under the Little Bay and General Sullivan Bridges, in Dover.



Enclosures

cc: Commission Members
Joel Anderson Committee Researcher

Final Report of the NH Tidal Energy Commission
(HB 694, Chapter 222, Laws of 2007)
November 2008

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Final Report of the NH Tidal Energy Commission (HB 694, Chapter 222, Laws of 2007) November 2008

Executive Summary

On June 25, 2007 Governor Lynch signed HB 694 (Chapter 222, Laws of 2007) establishing a Commission to study the feasibility of tidal (hydrokinetic) power generation under the Little Bay and General Sullivan Bridges, located in Dover and Newington. The Commission's primary duty is to identify and collect technical and sociological data, and investigate the regulatory requirements necessary to determine the feasibility of building a system for tidal power generation under the bridges.

Conclusions

The NH Tidal Energy Commission concludes:

1. Based on preliminary tidal flow data and environmental limitations to restricting that flow, and the need to maintain existing boating/shipping channels, it remains questionable whether a commercially viable power generation facility can be built beneath the Little Bay- General Sullivan bridges.
2. The hydrokinetic power generation industry in the US has not yet overcome technological challenges that limit large-scale development of generating facilities. The Commission feels that the tidal currents passing under the Little Bay- General Sullivan bridges provide a unique test environment to assess new technologies to harness power in a constricted flow configuration.
3. The Commission recognizes the opportunities for hydrokinetic technology testing and development at this location and encourages researchers at the University of New Hampshire to pursue such activities with the support of collaborators represented by the membership of the Commission.

Recommendations

The Commission makes the following recommendations for future legislation:

1. The Commission recommends legislation that would clarify the authority of the state to lease lands submerged under the waters of the state. Legislative Service Request (LSR) 2009-H-0689-R has been filed by Representative James Garrity, of Atkinson, to fulfill this recommendation.
2. The Commission recommends consideration be given to legislation that would allocate a portion of NH's Renewable Energy Fund (REF), generated by the state's renewable portfolio standards (RSA 362-F), for hydrokinetic research. These funds may be designated to meet non-federal match requirements for complimentary federal grant programs. This program might follow the

example of Rhode Island's program that has funded two hydrokinetic feasibility studies.

The NH General Court has established precedent by passing HB 1628 of 2008 that authorized the allocation of up to 10% of NH's REF to provide rebates for installing small-scale renewable generation. A similar allocation might be made to fund hydrokinetic feasibility studies in New Hampshire. The New Hampshire Public Utilities Commission also has the authority (under PUC Rules 2507.03 – Renewable Energy Incentives; see **Appendix 6**) to fund grant applications that it finds will: *“advance the purposes of RSA 362-F, within the constraint of available funds.”*

3. The Commission recognizes that there is a need for an ongoing Tidal Energy Commission or Advisory Council. It was suggested that the New Hampshire Coastal Program could convene annual meetings summarizing the status of tidal renewable energy issues. This recommendation does not require legislation, but the Commission requests that the NH Coastal program keep the members informed of hydrokinetic energy development activities in the vicinity of the Little Bay and General Sullivan Bridges.

Commission Membership

The Commission was comprised of 21 members, including members of the New Hampshire House of Representatives and Senate, the Department of Environmental Services, the Office of Energy and Planning, the Department of Transportation, the Public Utilities Commission, the Fish and Game Department, the Pease Development Authority – Division of Ports and Harbors, the Office of Consumer Advocate, the New Hampshire Estuaries Project, the City of Dover, the Town of Newington, the University of New Hampshire, the New Hampshire Commercial Fishermen's Association, the National Marine Fisheries Service, environmental protection and advocacy organizations, and the general public. The meetings of the commission began in August 2007 and ended in October 2008. There were eleven Commission meetings.

In September 2007 four subcommittees were formed to address issues pertinent to the Commission's goal. The subcommittees were:

1. Permitting Requirements
2. Public and Business Community Outreach
3. Wildlife and Environmental Impact Assessment
4. Technical Feasibility, Cost & Benefit Analysis.

Findings of the Subcommittees

The **Technical Feasibility, Cost & Benefit Analysis Subcommittee** examined the principal questions: How much electricity could be generated at the Little Bay – General Sullivan bridges' location and would a tidal generating project built there be commercially viable? The Subcommittee concluded that a tidal generating facility potentially constructed at the bridges' location could only harness approximately 15% of the available energy without significantly altering the normal ebb and flow of tides within

the upper reaches of the Great Bay estuary. The Subcommittee recognized that seeking regulatory approval for a generating project that would alter the natural flow would not be a worthwhile endeavor. Given the available input parameters for determining how much power could be generated, the Subcommittee concluded that on a steady-state basis approximately 1,400 kilowatts of power could be expected to be produced by installing hydrokinetic turbines under the bridges. Other limitations need to be considered, such as:

1. the need to maintain a navigation channel under the bridges,
2. the geometry of the tidal flow relative to the bridges and channel bottom,
3. the need to protect commercial fishing, wildlife, etc. from impacts, and
4. the approximate 2-knot (2.2 miles per hour) minimum current speed needed to spin most turbines.

With these considerations, the predicted amount of generating potential decreases to approximately 500 kilowatts. For comparison, the nearby PSNH Schiller Station has a generating capacity of approximately 145,000 kilowatts.

The Subcommittee also examined the current state of hydrokinetic generating technology. The Subcommittee agreed with one source that stated:

“it appears that the science and technology of ocean current and wave energy devices is lagging somewhat behind the entrepreneurial spirit. Prototype testing has seen some setbacks and even failures that can be traced to insufficient knowledge of the flow field around ocean turbines, ... debris loading, and unsteady forces transmitted to the turbine foundation/anchoring.”⁽¹⁾

In analyzing the successes and failures of other ventures, the Subcommittee noted that some of the reported “water to wire” efficiencies seem overstated. Field tests have been plagued by broken equipment and run times that generally fall short of commercially viable thresholds. Subcommittee members suggest that these problems arise from trying to move terrestrial wind farm technologies into the more aggressive marine environment.

Given the limited potential for a commercial hydroelectric generating facility at the Little Bay-General Sullivan bridges location, and the present state of hydrokinetic technology development, the Subcommittee recommended that the Commission endorse the concept of using the bridges’ location as a technology test environment for research and development by the University of New Hampshire and collaborators.

The report of the **Permitting Requirements Subcommittee** consists of an annotated list of the various regulatory agencies that would have jurisdiction over tidal hydropower (hydrokinetic) projects in the Little Bay – General Sullivan Bridges area. This list also

¹ Martin Wosnik, Chris White, Ken Baldwin, Rob Swift, Igor Tsukrov, David Gress, Michael Carter, Gordon Kraft, and Barbaros Celikkol, *Design Criteria and Standards for Viable Wave and Ocean Current Energy Generating Devices*, A White Paper submitted to the Minerals Management Service, March 2008

includes links to the agency websites (as active in September 2008) where more details can be obtained about the regulations.

One regulatory requirement noted by the subcommittee relates to the NH Site Evaluation Committee (SEC; RSA 162-H). The SEC jurisdiction is limited to: “*Electric generating station equipment and associated facilities designed for, or capable of, operation at any capacity of 30 megawatts or more*”. However, developers proposing generating projects with a capacity less than 30 megawatts may opt in to the SEC review process to expedite a coordinated review by the participating NH State agencies. Recent changes to RSA 162-H further expedites SEC review projects for renewable energy projects with a generating capacity between 5 and 30 megawatts.

Under the authority of the Federal Power Act (FPA), as amended, the Federal Energy Regulatory Commission (FERC) has the exclusive authority to license most nonfederal hydropower projects located on navigable waterways. FERC recommends that applicants wishing to study the possibility of hydrokinetics at a certain site first seek a preliminary permit. A preliminary permit, issued for up to three years, does not authorize construction; rather, it maintains priority of application for license (i.e., guaranteed first-to-file status), while the permittee studies the site and prepares to apply for a license. The permittee must submit periodic reports on the status of its studies. It is not necessary to obtain a preliminary permit in order to apply for or receive a license.

FERC has also developed a hydrokinetic pilot project licensing process. The goal of the pilot process is to allow developers to test new technologies, to determine appropriate siting of these technologies, and to confirm their environmental effects, while maintaining FERC oversight and agency input. The process, which can be completed in as little as 6 months, authorizes the construction, operation, and maintenance of hydrokinetic projects that are of limited size (5 megawatts or less), are easily removable or able to be shut down quickly, and are located in non-sensitive areas. Pilot licenses are issued for a term of 5 years.

The **Public and Business Community Outreach Subcommittee** concluded it would be premature at this time to conduct a public outreach campaign for the proposed tidal energy projects in the Piscataqua River. These projects are in the early, conceptual design stage and lack any concrete information such as type, location and number of turbines proposed. Without this information, it would be difficult for the public to provide meaningful input about any perceived impacts. However, lessons learned from the Cape Wind review process reveal that once details on the proposed project are solidified, stakeholder groups should be actively sought and the public should be allowed to participate early on in the review process.

The **Environmental and Wildlife Impact Assessment Subcommittee** (EWIAS) determined that most, if not all, resources potentially affected by a hydrokinetic project would be managed under the regulations identified by the Permitting Requirements subcommittee. Therefore it was deemed more appropriate to identify major categories of the environment (habitats) and wildlife, and not attempt to evaluate the potential extent of

the impacts. The Subcommittee developed a list of resources of concern and also identified additional studies and monitoring needs, and documents which identify resources in the area of the General Sullivan and Little Bay bridges. The Subcommittee recognized that additional resource areas or specific species may be identified during a more in-depth review.

Final Report of the NH Tidal Energy Commission (HB 694, Chapter 222, Laws of 2007) November 2008

Section I: Introduction

On June 25, 2007 Governor Lynch signed HB 694 (Chapter 222, Laws of 2007) establishing a Commission to study the feasibility of tidal (hydrokinetic) power generation under the Little Bay and General Sullivan Bridges, located in Dover and Newington. The Commission's primary duty is to identify and collect technical and sociological data, and investigate the regulatory requirements necessary to determine the feasibility of building a system for tidal power generation under the bridges. As outlined in HB 694 of 2007, the Commission was to investigate:

- (1) Permitting standards, including regulatory barriers to permitting of such projects.
- (2) The public's and business community's attitudes toward the project.
- (3) The environmental and wildlife impacts.
- (4) The cost and benefits of the project and potential for compensation to the state and municipalities.

The Commission was comprised of 21 members, including members of the New Hampshire House of Representatives and Senate, the Department of Environmental Services, the Office of Energy and Planning, the Department of Transportation, the Public Utilities Commission, the Fish and Game Department, the Pease Development Authority – Division of Ports and Harbors, the Office of Consumer Advocate, the New Hampshire Estuaries Project, the City of Dover, the Town of Newington, the University of New Hampshire, the New Hampshire Commercial Fishermen's Association, the National Marine Fisheries Service, environmental protection and advocacy organizations, and the general public. The Commission membership is listed in **Appendix 1**.

The Commission was required to make an initial report of its findings and any recommendations for proposed legislation on or before November 1, 2007, and make a final report on or before November 1, 2008. The initial report is available on the NH General Court Website: <http://www.gencourt.state.nh.us/statstudcomm/reports/1849.pdf>
This document represents the final report of the Commission.

At its inaugural meeting on August 29, 2007 the Commission elected co-chairs, State Representative Thomas Fargo, representing the City of Dover, and Dr. Kenneth Baldwin, representing the University of New Hampshire, as well as a vice chair, Ted Diers, representing the Department of Environmental Services Coastal Program. The Commission also selected the NHDES Coastal Program as the lead state agency to coordinate the efforts of the Commission. Information presented at the Commission meetings is available from the Coastal Program website: http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm

The activities of the Commission were built on groundwork established by an initiative that was contemporaneous with the General Court's review of HB 694. On February 23, 2007 the New Hampshire Coastal Program (NHCP) and the New Hampshire Office of Energy and Planning hosted a Tidal Energy Workshop at the NHCP Office in Portsmouth. The purpose of the workshop was to provide state, local and federal resource agency staff, regional planning commissions, municipalities, and state legislators and Congressional staff from New Hampshire and Maine with an overview of the technology of tidal energy and an understanding of the many uses and resources of the Piscataqua River. The meeting was also intended to provide insight into the Federal Energy Regulatory Commission's preliminary permit process for two recently proposed tidal energy projects and the process of energy facility evaluation, siting, construction and operation in New Hampshire. The workshop was held in light of two preliminary permit applications before the Federal Energy Regulatory Commission for tidal energy projects in the Piscataqua River in New Hampshire and Maine state waters.

The fact that the meeting was held demonstrates the state's efforts to get out in front of the tidal energy issue. Moreover, the fact that it was so well attended, by such a diverse group of people, signifies the level of interest that tidal energy and the two proposals had created. Details of the Workshop can be found on the Coastal Program's web site at: http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_workshop.htm.

This report documents the meetings of the commission, guest presentations, and the results of the subcommittee work. This is all presented in the context of HB 694 to investigate the feasibility of extracting power from the tidal flow under the General Sullivan Bridge and/or other suitable locations in the Great Bay Estuary.

The sequence of the following report sections begins with an overview of the meetings and the relevant items discussed. The report then moves to subcommittee activity and reports. The remaining two sections contain the commission summary and the Appendix where more detailed documents reside.

Section II: NHTEC Meetings

A. Brief Synopsis of Each Meeting

The meetings of the commission began on August 29, 2007 and ended on October 24, 2008. There were eleven (11) meetings. A brief synopsis of each meeting is presented here with the detailed minutes presented in **Appendix 2**.

August 29, 2007: The meeting was the initial meeting of the New Hampshire Tidal Energy Commission a.k.a. the commission. It was held at the NHDES Pease Field Office. Mr. Jack Pare from Newington made a presentation titled “Tidal Energy 101” which provided the foundation for the work ahead of the commission. The commission members introduced themselves and subsequently elected Mr. Tom Fargo and Dr. Ken Baldwin as commission co-chairs and Mr. Ted Diers as vice chair. The meeting was followed by a walking tour of the Little Bay – General Sullivan bridge site.

September 20, 2007: The meeting was held at the NHDES Pease Field Office. Mr. Carl Kammerer from NOAA/NOS/Center for Operational Oceanographic Products presented preliminary results from the 2007 Great Bay Estuary tidal current survey. This was the first comprehensive survey of this type in the estuary since 1976.

At this meeting, the Commission established four (4) subcommittees to facilitate its business. The subcommittees, formed by the Commission, addressed the following:

1. Permitting Requirements
2. Public and Business Community Outreach
3. Wildlife and Environmental Impact Assessment
4. Technical Feasibility, Cost & Benefit Analysis

The subcommittee membership is presented in the **Appendix 3**.

November 02, 2007: The meeting was held at the NHDES Pease Field Office. A draft of the Initial Report was presented and discussed, and subsequently edits were made. There was no scheduled speaker.

December 07, 2007: The meeting was held at NH Fish & Game Region 3 Office in Durham. Mr. Evan Muholland, NH Department of Justice made a presentation about legal issues concerning submerged land use. The summary of this discussion is on the NHDES website and included in the Appendix. Subcommittee activities and reports to date were discussed. The Commission amended and approved the Initial Report that was subsequently submitted to the General Court as required in Chapter Law 222.1.

January 18, 2008: The meeting was held at the NHDES Pease Field Office. There were two guest speaker presentations. Mr. Michael Hoover and Mr. Daniel Power from OCEANA Energy Company presented an overview of their company’s activity and developments pertaining to the technology development and their FERC permit in the Piscataqua River. Mr. Rob Cinq-Mars (Free Flow Energy, Inc.) presented his analysis on

the tidal current data acquired by Carl Kammerer. Brief reports were made by the subcommittees.

February 15, 2008: The meeting was held at the NHDES Pease Field Office. The guest speaker was Ms. Denise Vauthier from Underwater Electric Kite (UEK) Corporation. She presented her company's present technology and how it related to the FERC permit held for the Piscataqua River. Subcommittee reports were updated.

April 11, 2008: The meeting was held at the NHDES Pease Field Office. There was no guest speaker scheduled. Professor Baldwin made an informal presentation defining the nuances of the spatial and temporal variations in the tidal current speed and how it relates to 'naturally available energy'. The salient features of this presentation are in the meeting minutes in the Appendix. Subcommittee work was discussed.

May 16, 2008: The meeting was held at the NHDES Pease Field Office. No guest speaker was scheduled. The discussion focused the work of the commission and the need to complete the work over the summer 2008 and write a report.

August 08, 2008: The meeting was held at the NHDES Pease Field Office. A quorum of Commission members was not present. The draft final report was discussed. A "to-do" list of items needed for the final report was prepared. The Commission's conclusions were reviewed and discussed.

September 26, 2008: The meeting was held at the NHDES Pease Field Office. The draft final report was discussed further. The "to-do" list of items needed for the final report was reviewed and discussed. The Commission's conclusions were reviewed and two additional recommendations were discussed.

October 24, 2008: The meeting was held at the NHDES Pease Field Office. Discussion focused on the draft final report. Edits were made to the Executive Summary.

A complete set of meeting minutes are included in this document in **Appendix 2** under "Compilation of Meeting Minutes".

Section III: Subcommittee Reports

In September 2007 four subcommittees were formed to address issues pertinent to the Commission's goal. The subcommittees were:

1. Permitting Requirements
2. Public and Business Community Outreach
3. Wildlife and Environmental Impact Assessment
4. Technical Feasibility, Cost & Benefit Analysis.

These subcommittees met on numerous occasions outside the regular Commission meetings, did their work and their reports are presented below:

A. Permitting Requirements Subcommittee Report

As with the November 2007 Initial Report of the Commission, the report of the Permitting Requirements Subcommittee consists of an annotated list of the various regulatory agencies that would have jurisdiction over tidal hydropower (hydrokinetic) projects in the Little Bay – General Sullivan Bridges area. This list also includes links to the agency websites (as active in September 2008) where more details can be obtained about the regulations.

List of Applicable Laws & Regulations (Last Revised September 29, 2008)

Local:

City of Dover and Town of Newington

RSA 674 - Local Land Use Planning & Regulatory Powers

RSA 674:54 Governmental Land Uses

I. Governmental use means a use, construction, or development of land owned or occupied, or proposed to be owned or occupied, by the state, county, town, city..., for any public purpose which is statutorily or traditionally governmental in nature. Use is subject to governing body and planning board review.

II-a. Any use, construction, or development of land occurring on governmentally owned or occupied land, but which is not a governmental use, shall be fully subject to local land use regulations.

III(b). The erection, installation, or maintenance of poles, structures, conduits and cables, or wire in, under, or across any public highways under RSA 231...is exempt from this section.

<http://www.gencourt.state.nh.us/rsa/html/LXIV/674/674-54.htm>

Regional:

Rockingham and Strafford Regional Planning Commissions

RSA 36 - Regional Planning Commissions

RSA 36:54-57 Review of Development of Regional Impact

Regional Planning Commissions are required to be notified and afforded opportunity to provide comments on any “development of regional impact.”

“Development of regional impact” means any proposal before a local land use board that the board determines could reasonably be expected to impact a neighboring municipality...”

<http://www.gencourt.state.nh.us/rsa/html/III/36/36-mrg.htm>

State:

Department of Environmental Services (DES) –

Alteration of Terrain Bureau:

Per RSA 485-A:17 (Terrain Alteration) and implementing rules (Env-Ws 415 or successor rules), a permit is required for land alteration activities of 50,000 sq.ft. (1.1 acres) or more in the protected shoreland (within 250 feet of the highest observable tide line) and in excess of 100,000 sq.ft. (2.3 acres) elsewhere.

<http://des.nh.gov/organization/divisions/water/aot/index.htm>

Watershed Management Bureau:

New Hampshire Coastal Program (NHCP): In accordance with the Coastal Zone Management Act Federal Consistency Regulations (15 CFR Part 930), the NHCP reviews and issues consistency decisions for many federal activities that take place in the coastal zone. Federal activities are defined as those activities conducted by, or on behalf of, a federal agency, those that require a federal license or permit (e.g., Army Corps of Engineers (ACOE) Rivers and Harbors Act (RHA) Section 10 permit, ACOE Clean Water Act Section 404 permit, Federal Energy Regulatory Commission (FERC) hydroelectric license, and U.S. Coast Guard RHA Section 9 bridge permit), and those that involve federal funding. Federal activities must be consistent with the NHCP’s enforceable policies. The NHCP coordinates with a number of networked agencies, including, in part, the New Hampshire Fish and Game Department and other Bureaus within DES, during the federal consistency review process.

http://des.nh.gov/organization/divisions/water/wmb/coastal/federal_consistency.htm

401 Water Quality Certification: The DES Watershed Management Bureau issues Clean Water Act Section 401 Water Quality Certifications to applicants for a federal license or permit to conduct any activity that may result in a discharge into navigable waters. Applicants must provide the federal licensing or permitting agency with a certification from the state that the discharge will meet state surface water quality standards.

<http://des.nh.gov/organization/divisions/water/wmb/section401/index.htm>

Wetlands Bureau:

Per RSA-482-A (Fill and Dredge in Wetlands) and implementing rules (Env-Wt 100-800), a permit is required from the Wetlands Bureau for the placement of any dredge or fill material, including structures, in state surface waters, including all lands submerged or flowed by mean high tide, and those areas within 100 feet of the highest observable tide line. The Wetlands Bureau coordinates with the NH Fish & Game Department, in part, pursuant to the Endangered Species Conservation Act (RSA 212-A:9), and the Department of Resources and Economic Development (DRED)- Natural Heritage Bureau, pursuant to the Native Plant Protection Act of 1987 (RSA 217-A:7).

<http://des.nh.gov/organization/divisions/water/wetlands/index.htm>

Construction, excavation or filling activities taking place in the protected shoreland (within 250 feet of the highest observable tide line) requires a shoreland permit from the Wetlands Bureau, in accordance with RSA 483-B, the Comprehensive Shoreland Protection Act (Act), and implementing rules (Env-Wq 1400). Currently, activities located in the protected shoreland must maintain compliance with the Act.

<http://des.nh.gov/organization/divisions/water/wetlands/cspa/index.htm>

Fish & Game Department (F&G) -

F&G coordinates with the DES Wetlands Bureau during review of wetlands applications, in part, pursuant to the Endangered Species Conservation Act (RSA 212-A:9).

<http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-XVIII-212-A.htm>

Department of Resources & Economic Development (DRED), Natural Heritage Bureau -

DRED coordinates with the DES Wetland Bureau during review of wetlands applications, pursuant to the Native Plant Protection Act of 1987 (RSA 217-A:7).

<http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-XIX-217-A.htm>

Division of Historical Resources (DHR) -

All federally funded, licensed, or assisted projects are subject to the review requirements of Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470), implemented by the procedures of the federal Advisory Council on Historic Preservation, Protection of Historic Properties (36 CFR Part 800). Federal agencies or their legal designees are required to take into account the possible impacts of their projects on historical resources, and to submit proposed projects to the Director/State Historic Preservation Officer (SHPO) of the Division of Historical Resources, for a determination of potential effects on properties that are listed, or are eligible for listing, in the National Register of Historic Places.

*Section 106 review is typically conducted as part of the ACOE Programmatic General Permit or Individual Permit review, pursuant to Section 404 of Clean Water Act.

<http://www.nh.gov/nhdhr/review>

Site Evaluation Committee (SEC) -

SEC jurisdiction is limited to: *“Electric generating station equipment and associated facilities designed for, or capable of, operation at any capacity of 30 megawatts or more”*. However, developers proposing generating projects with a capacity less than 30 megawatts may opt in to the SEC review process to expedite a coordinated review by the participating NH State agencies. Recent changes to RSA 162-H further expedites SEC review projects for renewable energy projects with a generating capacity between 5 and 30 megawatts.

Pursuant to RSA 162-H:

RSA 162-H:1 Declaration of Purpose

“The legislature recognizes that the selection of site for energy facilities will have a significant impact upon the welfare of the population, the economic growth of the state and the environment of the state. The legislature, accordingly, finds...that the state ensure that the construction and operation of energy facilities is treated as a significant aspect of land-use planning in which all environmental, economic and technical issues are resolved in an integrated fashion. The legislature, therefore, hereby establishes a procedure for the review, approval, monitoring and enforcement of compliance in the planning, siting, construction and operation of energy facilities.”

“The legislature also finds that the present and predicted growth in electric power demands in the state of New Hampshire requires the development of a procedure for the selection and utilization of sites electric generating facilities and the identification of a state position with respect to each proposed site.”

RSA 162-H:2 Definitions

The definition of "renewable energy facility" includes electric generating station equipment and associated facilities powered by ocean thermal, wave, current, or tidal energy.

RSA 162-H:4 Powers of the Committee

Issue certificates (with or without conditions) or deny certificates for proposed energy facilities, including renewable energy facilities, or forward its findings to the Public Utilities Commission for proposed bulk power supply facilities.

RSA 162-H:6-a Time Frames for Review of Renewable Energy Facilities

Within 240 days of the acceptance of an application (the committee shall decide whether or not to accept an application within 30 days of filing), the subcommittee shall issue or deny a certificate for a renewable energy facility.

- SEC's certificate is issued only after all necessary state permits are issued
- SEC's Organizational Rules (Chapter 100), Procedural Rules (Chapter 200) and Certificates of Site & Facility Rules (Chapter 300) were adopted on June 16, 2008.

<http://nhsec.state.nh.us>

Department of Transportation (DOT) –

The following is a brief summary of the various laws and DOT policies governing occupancy within highway rights-of-way (ROW):

Utility Accommodation Manual (May 1998) - This manual establishes a uniform practice for addressing the accommodation of utilities within the State ROW. It provides administrative procedures and sets minimum requirements for the location, installation, adjustment, and maintenance of utility facilities. Under the manual, DOT would regulate the installation or attachment of lines emanating from the tidal power generating equipment, should said lines be located within the ROW, or any equipment attached to a highway bridge structure.

RSA 228:21 grants the authority to the Commissioner of DOT for all matters pertaining to the highway system including the manner in which highways (or portions thereof) are maintained.

RSA 230:1 grants the DOT full control for the construction, reconstruction, and maintenance of all Class 1 Highways, including bridges thereon.

RSAs 231:159 thru 231:189 provide provisions for utility lines, poles, structures, and appurtenances to be placed within the Highway ROW. The RSAs dictate jurisdiction, and permitting and licensing procedures.

RSAs 236:9 thru 236:12 provide provisions governing excavations within the Highway ROW and the need to procure written permission from the Commissioner of DOT.

RSA 236:18 provides the State with exclusive rights to the air space directly above and below the toll and interstate Highway ROW. The DOT is designated the responsibility to administer and enforce this right.

RSA 236:19 provides a penalty for the placement of obstructions or substances within the Highway ROW or adjacent to the Highway, which may direct or redirect water and damage the Highway and/or render it unsuitable for public travel.

RSAs 236:38 & 236:39 include penalties and civil liabilities for damages to highways and bridges that are caused by obstructions placed without authority.

RSA 237:5 authorizes the Commissioner of DOT to operate and maintain the NH Turnpike system and in doing so grant permits or licenses to any person or party to place and maintain wires, pipes, structures, etc. so as not to be unsightly or interfere with the safe and convenient operation of the system.

<http://www.nh.gov/dot/public/rules.htm>

Public Utilities Commission (PUC) -

The following statutes and rules could apply to tidal water facilities. Whether they apply would depend on the specifics of a particular facility, including, for example, the facility's ownership, function, operations, customers, etc.

GENERAL ELECTRIC UTILITY PROVISIONS

RSA 362 grants the PUC regulatory authority over the operations of public utilities in the State of New Hampshire.

The Puc 300 rules govern the provision of electric service in the State of New Hampshire, generally.

The Puc 2000 rules govern the operation of competitive electric power suppliers in the state.

Puc 2002.04 defines a "competitive electric power supplier (CEPS)" as "any person or entity that sells or offers to sell electricity to retail customers by using the transmission and/or distribution facilities of any public utility in this state. CEPS includes but is not limited to owners of electric generating facilities, marketers of electricity, and

municipalities selling or offering to sell electricity. A CEPS sells to the public and does not include an entity that sells only to its affiliate.”

LICENSING OF UTILITY FACILITIES OVER, UNDER OR ACROSS PUBLIC WATERS

RSA 371:17 requires a utility to obtain approval and a license from the PUC prior to constructing a “pipeline, cable, or conduit, or a line of poles or towers and wires and fixtures thereon, over, under or across any of the public waters of this state.” Public waters include “all ponds of more than 10 acres, tidewater bodies, and such streams or portions thereof as the commission may prescribe.”

RENEWABLE ENERGY PROVISIONS

RSA 362-F establishes an Electric Renewable Portfolio Standard to stimulate the development of renewable energy generation in the state. RSA 362-F:4 identifies various classes of electric renewable energy. RSA 362-F:4, I(d) identifies the production of electricity from ocean thermal, wave, current or tidal energy as Class I (New) renewable energy.

The Puc 2500 rules implement the Electric Renewable Portfolio Standard established in RSA 362-F.

Puc 2502.07 identifies a generation facility that produces electricity from ocean thermal, wave, current, or tidal energy as a “Class I” renewable energy pursuant to RSA 362-F:4.

RSA 362-A, the Limited Electrical Energy Producers Act, provides for “small scale and diversified sources of supplemental electrical power to lessen the state’s dependence upon other sources,” finding “that net energy metering for eligible customer-generators may be one way to...encourage private investment in renewable energy resources, stimulate in-state commercialization of innovative and beneficial new technology, enhance the future diversification of the state’s energy resource mix, and reduce interconnection and administrative costs.”

The Puc 900 rules govern net metering for customer-owned renewable energy generation resources of 25 kilowatts or less.

Puc 902.04 refers back to RSA 362-A:1, II-b to define an “eligible customer-generator (ECG).” The current rule defines an ECG as “an electric utility customer who owns and operates electrical generating facilities powered by solar, wind or hydro energy with a total peak generating capacity of not more than 25 kilowatts.” However, the source statute was modified in 2007 (see below); the Puc 900 rules are currently being updated to reflect the new statute.

RSA 362-A was modified in 2007 to define an ECG as “an electric utility customer who owns and operates electrical generating facilities powered by renewable energy with a

total peak generating capacity of not more than 100 kilowatts that is located on the customer's premises, is interconnected and operates in parallel with the electric grid, and is intended primarily to offset part or all of the customer's own electricity requirements.”

<http://www.puc.nh.gov/Regulatory/rules.htm>

Federal:

Federal Energy Regulatory Commission (FERC) –

In accordance with the Federal Power Act (FPA) (16 U.S.C. 791a et seq, as amended), a potential developer of a hydroelectric project (including hydrokinetics) must file an application for license or exemption from licensing with FERC if the project is or will be:

1. located on a navigable waterway of the U.S.;
2. occupying U.S. lands;
3. utilizing surplus water or water power from a U.S. government dam; or
4. located on a body of water over which Congress has Commerce Clause jurisdiction, project construction occurred on or after August 26, 1935, and the project affects the interests of interstate or foreign commerce.

Pursuant to Section 797(e) of the FPA:

No license affecting the navigable capacity of any navigable waters of the U.S. shall be issued until the plans of the dam or other structures affecting the navigation have been approved by the Chief of Engineers and the Secretary of the Army.

In deciding whether to issue any license...for any project FERC, in addition to the power and development purposes for which licenses are issued, shall give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

Pursuant Section 803(a) of the FPA:

FERC shall consider the recommendations of federal and state agencies exercising administration over flood control, navigation, irrigation, recreation, cultural and other relevant resources of the state in which the project is located.

Pursuant to Section 803(j) of the FPA:

That in order to adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and habitat) affected by the development, operation, and management of the project, each license issued under this

subchapter shall include conditions for such protection, mitigation, and enhancement. Such conditions shall be based on recommendations received pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq, as amended) from the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and state fish and wildlife agencies.

Pursuant to Section 808(c) of the FPA:

Each applicant for a new license shall consult with the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the appropriate state fish and wildlife agencies, and, as appropriate, conduct studies with such agencies.

FERC recommends that applicants wishing to study the possibility of hydrokinetics at a certain site first seek a preliminary permit. A preliminary permit, issued for up to three years, does not authorize construction; rather, it maintains priority of application for license (i.e., guaranteed first-to-file status), while the permittee studies the site and prepares to apply for a license. The permittee must submit periodic reports on the status of its studies. It is not necessary to obtain a preliminary permit in order to apply for or receive a license. FERC has developed a “strict scrutiny” approach to reviewing preliminary applications.

In November 2007 FERC issued a policy statement on conditioned licenses for hydrokinetic energy projects. In the statement, FERC concluded that, in appropriate cases, where it has completed its processing of license applications for hydrokinetic projects, but where other authorizations required under federal law have not yet been received, it may issue conditioned licenses for hydrokinetic projects. In accordance with these licenses, the licensee would be precluded from commencing construction until receiving all the necessary federal authorizations.

FERC has also developed a hydrokinetic pilot project licensing process. The goal of the pilot process is to allow developers to test new technologies, to determine appropriate siting of these technologies, and to confirm their environmental effects, while maintaining FERC oversight and agency input. The process, which can be completed in as little as 6 months, authorizes the construction, operation, and maintenance of hydrokinetic projects that are of limited size (5 megawatts or less), are easily removable or able to be shut down quickly, and are located in non-sensitive areas. Pilot licenses are issued for a term of 5 years.

<http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics.asp>

Department of Homeland Security, U.S. Coast Guard (USCG) –

Section 9 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401) and the General Bridge Act of 1946:

The purpose of these Acts is to preserve the public right of way and to prevent interference with interstate and foreign commerce. The Acts placed the navigable waters

of the U.S. under the exclusive control of the USCG to prevent any interference with their navigability by bridges or other obstructions except by permission of the U.S. government.

Applicants must apply to the USCG for a bridge permit to reconstruct or modify an existing bridge across navigable waters of the U.S.

http://www.navcen.uscg.gov/mwv/regulations/regs_home.htm

US Army Corps of Engineers (ACOE) –

Clean Water Act (CWA) Section 404 (33 U.S.C. 1344) and Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. 403):

The ACOE regulates the discharge of dredged or fill material into navigable waters, pursuant to Section 404 of the CWA. The ACOE regulates obstructions to the navigable capacity of any waters of the U.S., and construction of wharves, piers, weirs, breakwaters, bulkheads, jetties, or other structures in any port, harbor, canal, navigable river, or other water of the U.S., pursuant to Section 10 of the RHA. In New Hampshire, the ACOE utilizes the Programmatic General Permit (PGP) process to ensure expedited review of minimal impact activities (those with minimal individual and cumulative effects on the aquatic environment) in the ACOE's jurisdiction under CWA Section 404 and Section 10 of the RHA. Those projects that do not qualify for the PGP are subject to Individual Permit (IP) review.

- As part of the PGP process, applicants for projects qualifying as Minor or Major Impact Projects must submit a copy of their application materials to the NH State Historic Preservation Officer (SHPO) for review. The SHPO notifies the ACOE if there are concerns that the proposed project will have an effect on historic resources.
- The ACOE reviews all applications for Minor and Major projects with an interagency team comprised of the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and the DES Wetlands Bureau.

<http://www.usace.army.mil/cw/cecwo/reg/sadmin3.htm>

U.S. Fish and Wildlife Service (USFWS) –

As member of the interagency team reviewing applications submitted to the ACOE for impacts within the ACOE's jurisdiction under CWA Section 404 and/or Section 10 of the RHA, USFWS provides comments on potential impacts to threatened and endangered species, pursuant to the Endangered Species Act (16 U.S.C. 1531 et seq)

<http://www.fws.gov/endangered/whatwedo.html#General>

National Oceanic and Atmospheric Administration (NOAA) –

Federal action agencies such as the ACOE, USCG, and FERC must consult with NOAA's National Marine Fisheries Service (NMFS) for the protection and preservation of aquatic resources, endangered species and marine mammals potentially affected by the permitted or funded action. NMFS provides comments and recommendations to reduce the potential impacts to federally managed species and their habitat, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq, as amended). Comments and recommendations for the preservation and protection of living aquatic species and habitat not under the jurisdiction of the MSA are provided pursuant to the Fish and Wildlife Coordination Act. Potential impacts on threatened and endangered species and marine mammals are evaluated pursuant to the Endangered Species Act and Marine Mammal Protection Act (16 U.S.C. 1361 et seq) respectively. The Federal Power Act (FPA) provides NMFS, through the Department of Commerce (DOC), the authority to prescribe fish passage measures to ensure migratory finfish access to spawning, nursery and rearing habitat. Additionally, the FPA provides NMFS the authority to recommend conservation measures for the protection and enhancement of aquatic resources. The National Marine Sanctuaries Act authorizes NOAA's National Ocean Service, through the DOC, to recommend reasonable and prudent alternatives to avoid destruction, loss or injury to Sanctuary resources.

<http://www.nmfs.noaa.gov/pr>

Environmental Protection Agency (EPA) –

As member of interagency team reviewing applications submitted to the ACOE for impacts within the ACOE's jurisdiction under CWA Section 404 and/or Section 10 of the RHA, EPA provides comments on potential impacts to aquatic resources, pursuant to CWA Section 404.

<http://www.epa.gov/owow/wetlands/laws>

National Environmental Policy Act (NEPA) –

Pursuant to NEPA (42 U.S.C. 4321 et seq), prior to taking any "major" or "significant" action, federal agencies must consider the environmental impacts of that action. Major federal actions include actions subject to federal regulation. In practice, an action is required to meet NEPA guidelines when a federal agency provides any portions of the financing for the action. Review of an action by a federal agency, however, can also be deemed a federal action that triggers NEPA review. The twin objectives of NEPA are to: 1) consider every significant aspect of the environmental impact of the proposed action; and 2) inform the public that the federal agency did consider environmental concerns in its decision making process.

<http://ceq.hss.doe.gov/nepa/nepanet.htm>

B. Public and Business Community Outreach Subcommittee Report

The November 2007 Initial Report of the Commission identified the following strategies and approaches for this subcommittee:

- Commission should coordinate outreach with upcoming UNH forum on renewable energy and Rockingham Planning Commission efforts (website surveys?)
- Model efforts after Cape Wind Project, avoid negatives, build on positive outreach aspects of that project. Focus on tidal power as one of several renewable energy sources.
- Coordinate with Great Bay Estuarine Research Reserve (NOAA), UNH Cooperative Extension (Sea Grant?) and NH Estuaries Project, Chambers of Commerce activities.
- Assess market value of a tidal energy project.
- Would like to conduct survey or conduct charette but Commission has no budget. Survey to focus on interviews of stakeholders; commercial fishermen & lobstermen, recreational users of the tidal waters.
- Conduct a public hearing when findings/final report is approximately 70% complete.
- Key questions that need to be answered before assessing the public's and business leader's attitudes:
 - What will the turbines and associated installed components look like?
 - Who benefits from the project? Corporations or utility customers?
 - How much energy will envisioned tidal projects produce?
 - Who are the key players (stakeholders)?

The **Public and Business Community Outreach Subcommittee** concluded it would be premature at this time to conduct a public outreach campaign for the proposed tidal energy projects in the Piscataqua River. These projects are in the early, conceptual design stage and lack any concrete information such as type, location and number of turbines proposed. Without this information, it would be difficult for the public to provide meaningful input about any perceived impacts. However, lessons learned from the Cape Wind review process reveal that once details on the proposed project are solidified, stakeholder groups should be actively sought and the public should be allowed to participate early on in the review process.

At its December 2007 meeting, the Subcommittee developed the following outline for a potential future outreach effort.

**NH Tidal Energy Public and Business and Community Outreach Subcommittee
Draft Work Plan (December 2007)**

Primary Objective

To familiarize the target audience(s) with the proposed concept of tidal power generation under the Little Bay and General Sullivan Bridges through outreach activities that facilitate productive public dialogue and enhance decision making.

Target Audience

Identify and develop a mailing list for key stakeholders.

- Great Bay NH and Maine Local and state elected officials
- Greater Dover and Portsmouth Chambers of Commerce
- Local media
- River stakeholders
- Waterfront industrial businesses
- Local Conservation Commissions
- Local environmental non-profits
- Commercial and recreational stakeholders
- Great Bay Researchers and scientists

Key Messages

Determine the key issues and questions that will be asked by the target audience/stakeholders.

- What is tidal power generation? (Frequently Asked Questions)
- How is tidal power different from other renewable energy sources?
- What is the benefit of renewable energy from tidal power?
- Are there existing tidal energy projects in other parts of the country/world? What were there successes and failures?
- How would tidal power fit into the existing energy supply?
- Why is the additional power needed? What is the benefit of the additional power?
- Would other engineering options be considered to harness tidal power?
- What Communities would be impacted?
- What is the project's costs and timetable?
- Would NH customer electric rates rise or fall because of this project?
- Would there be a noticeable physical change in the Great Bay area in which the tidal energy turbines will be located?
- What would happen to the area's wildlife?
- Would my property value diminish as a result of this tidal power construction?
- How would the turbines impact boating and recreational safety?

- Would there be adverse impacts to the commercial fishing industry?
- Who would own the electric generation facility?
- Would I be able to purchase electricity from the tidal energy project?

Outreach Communication

Determine how to best communicate with key stakeholders (public forum, informational mailing, FAQ's media, outreach sessions, etc.) Add website.

Stakeholder Involvement: Lessons from Cape Wind

One of the strategies for achieving the public's and the business communities' support for a New Hampshire tidal energy project, identified in the Commission's November 2007 initial report, was to learn from the experiences of the Cape Wind project in Massachusetts, and plan an effective outreach and education program that avoids the pitfalls experienced by that project.

Public support is a crucial component in the development of renewable energy projects. Fortunately there are a number of examples of renewable energy projects that have had varying levels of involvement from the public. In the New England region, one of the more notable projects is the Cape Wind proposal in Nantucket Sound off the shores of Massachusetts. It was first proposed in 1999 by a group of renewable energy minded individuals on Cape Cod but didn't start to take shape until 2001 when the project, with financial backing of Energy Management Inc. (EMI), applied for federal permits. The proposal entails 130 turbines, spanning across an area of 24 square miles and would produce 450 megawatts of electricity at its peak capacity. It remains under review by the Federal Minerals Management Service.

In the early stages of development, stakeholder involvement was minimal. It wasn't until October 2002 when the first formal stakeholder involvement process began through efforts undertaken by the Massachusetts Technology Collaborative. Over the course of 6 months, 6 meetings were held on Cape Cod to inform the public about the proposal, the review process and to allow a forum for stakeholders to express their ideas. The meetings were largely viewed as a success because of the equitable manner it was presented and the valuable information collected about the public's opinions on the project. Aside from the MTC stakeholder sessions, there have been numerous public hearings by local, state and federal agencies across Cape Cod, Martha's Vineyard, Nantucket and Boston areas. There were several significant hearings for the two Draft Environmental Impact statements issued by the Army Corp of Engineers in 2004 and the Minerals Management Service in 2007 respectively. During these meetings and in the comment periods thereafter, thousands of comments were collected and ultimately have helped to guide the project in its review.

Key lessons about the involvement of the public in the decision making process have been learned throughout the course of the Cape Wind proposal. They include:

Early Involvement: The public should be involved early in the decision making process. By involving the public early, measures can be taken to mitigate potential impacts and education materials can be refined to address specific concerns which may have gone unnoticed or may have been prioritized as a lower concern.

Open Process: The public review process including all documents should be open and made available to the public.

Actively Seek Involvement: Reviewing agencies should identify all stakeholder groups and actively seek their involvement.

Projects Scale: The scale of the project will determine the level of acceptance the public has towards the perceived impacts. Larger projects will involve a greater level of involvement from the public and the public's level of acceptance. This should not be confused with the public's sentiment of support or opposition, which is not diminishable relative to the scale of the project.

Familiarity with Technology: The more familiar the public is with the renewable energy technology, the more accepting they will be of the project.

Independent Research: Research from third party organizations are an integral component in educating the public about the potential benefits and impacts purported by the project.

In the end, there will never be unanimous consensus on the construction of a renewable energy project but measures should be taken to strive for the greatest achievable level of public acceptance.

C. Environmental and Wildlife Impact Assessment Subcommittee Report

The November 2007 Initial Report of the Commission identified the following preliminary work plan for this subcommittee:

The Wildlife and Environmental Impact Assessment Subcommittee's areas of assessment parallel many of the Permitting Requirements Subcommittee's issues listed above. This Subcommittee's work may follow the work of others.

Strategies and approaches outlined in November 2007 included:

- Inventory wildlife and environmental assessments already completed: NH Dept. of Transportation - Spaulding Turnpike Newington-Dover Project Draft EIS, see Chapter 3: <http://www.newington-dover.com/deis.shtml> ; The Nature Conservancy (?); others?
- What are the critical resources to be protected in the area of the project.
- Other issues to be considered:
 - Assess wildlife habitats, breeding areas, birds, fish
 - Blocking factor of turbines
 - Amount of energy extracted & effects on down stream flow/sites
 - Local impacts of turbines due to flow acceleration, sedimentation, water quality, temperature
 - Seabed erosion / foundations
 - Navigational risks
 - Machinery noise

The Environmental and Wildlife Impact Assessment Subcommittee (EWIAS) determined that most, if not all, resources potentially affected by a hydrokinetic project would be managed under the regulations identified by the Permitting Requirements subcommittee. Therefore it was deemed more appropriate to identify major categories of the environment (habitats) and wildlife, and not attempt to evaluate the potential extent of the impacts.

The list below identifies many of the broader resources areas of concern along with specific examples. The list of resources of concern is thorough but not all encompassing. Additional resources areas or specific species may be identified during a more in-depth review. Also identified are studies and monitoring needs, and documents which identify resources in the area of the General Sullivan and Little Bay bridges. These are summary lists and should not be considered comprehensive.

- Aquatic Resources
 - Threatened and Endangered Species
 - State and Federally listed
 - Bald Eagle
 - Osprey
 - Peregrine falcon
 - Common Tern, roseate tern, least tern, arctic tern
 - Shortnose Sturgeon
 - Atlantic Sturgeon (federal candidate species)

- Marine mammals
 - Harbor seals
 - Bottlenose dolphin (possible)
 - Harbor porpoise (possible)
 - Hooded seal (rare occurrence)
 - Humpback whale (rare occurrence)
- Essential Fish Habitat
 - 17 species total
 - Atlantic salmon
 - Bluefish
 - Winter flounder
 - Atlantic sea herring
 - Atlantic cod
- Recreational and Commercial Fisheries
 - Stripped bass
 - Lobster
 - Rainbow smelt
 - Atlantic tomcod
 - American eel
 - Alewife and blueback herring
 - Brown trout
- Non-managed species
 - Sea Lamprey
 - White bass
 - Horseshoe crab
 - Other resident and migratory species
- Special Aquatic Sites
 - Mudflats
 - Eelgrass
 - Saltmarsh
- Shellfish beds
- Sampling, Studies, and Monitoring
 - Marine mammals
 - Diving birds
 - Migratory and resident fish
 - Infauna and epifauna
 - Zooplankton
 - Substrate mapping
 - Sediment and nutrient transport studies
 - Noise
 - EMF's
 - Hydrodynamic modeling (current profiling)
 - Temperature
- Appurtenant facility impacts
 - Dredging

- Fill
- Stabilization
- Infrastructure needs
- Associated Habitat Concerns
 - Wave amplitude
 - Storm surge
 - Large debris
 - Fouling
- Temporary and Permanent Impacts
 - Fish passage
 - Avoidance
 - Entrainment
 - Disruption of migration
 - Bird and Mammal
 - Avoidance
 - Entrainment
 - Disruption of behavior
 - Recreational and Commercial fisheries
 - Sediment Deposition and erosion
 - High current area may create a scouring affect for bottom anchored structures.
 - Need for erosion control
 - Cumulative impacts on currents and tides
 - A small scale project at the bridge may be insufficient to warrant concern for impacting the amplitude and intensity of currents and tides in Great Bay.
 - Need to evaluate full grow out of potential hydrokinetics to evaluate impact on the system.
 - Habitat conversion
 - Would placement of structures mimic available habitat?
 - Would placement of structures encourage colonization of new suite of species, including non-natives?
 - Noise and vibration
 - Electromagnetic fields (EMF)
 - Contaminants (oils, chemicals, waste, litter)
- Need for Mitigation
 - Best Management Practices (BMPs) to avoid and minimize impacts
 - Compensatory mitigation if necessary

- Existing material
 - Spaulding Turnpike EA and EFH Assessment (2006)<http://www.newington-dover.com/feis.shtml>
 - Mathieson, A.C., C.D. Neefus, and C. Emerich Penniman. 1983, *Benthic ecology in an estuarine tidal rapid*. Botanica Marina 26:213-230. (Contribution No. 1225 from Agricultural Experiment Station Series)
 - Endangered and Threatened Wildlife of New Hampshire - NHFG (http://www.wildlife.state.nh.us/Wildlife/Nongame/endangered_list.htm)
 - A Technical Characterization of Estuarine and Coastal New Hampshire (<http://www.nhep.unh.edu/resources/pdf/atechnicalcharacterization-nhep-00.pdf>)
 - Others material

D. Technical Feasibility, Cost & Benefit Analysis Subcommittee

The November 2007 Initial Report of the Commission identified the following preliminary work plan for this subcommittee:

- How much energy could be harnessed under the bridges (megawatts)? What is available from tidal prism? With turbine efficiency flow restriction considerations, how much generation is feasible?
- What type of entity would build the facility? Merchant power company or regulated utility? Municipal government or regional municipal cooperative?
- Can or should the State and municipalities charge fees or tax on the generating facilities and/or power produced? How are run-of-river hydroelectric facilities taxed?
- Can the State lease or charge rental fees for attachments to state infrastructure? How much is this worth?
- Does the State have the authority to lease submerged lands similar to aquaculture leasing model?
- What is the effect of the Renewable Portfolio Standards Law (RSA 362-F) <http://www.gencourt.state.nh.us/rsa/html/XXXIV/362-F/362-F-mrg.htm> in establishing incentives for tidal power generation? Is there a potential to use Alternative Compliance Payments, set forth in the RSA 362-F, to develop the project? What is the amount of avoided carbon emissions for the project relative to potential carbon credits as anticipated in the proposed Regional Greenhouse Gas Initiative (RGGI) legislation.
- Other issues to be considered:
 - Site research
 - Site preparation
 - Logistics
 - How much energy extracted per dollar invested
 - Installation cost
 - Maintenance cost
 - Replacement cost

Additional Subcommittee Tasks/Questions Identified in September 2008

- Estimate of harnessable power and how determined.
- Assessment of commercial/economic viability. Develop a list of considerations for evaluation, including “water-to-wire” efficiency and how run-of-river hydropower experiences might constrain the economic viability estimates.
- Would the U.S. Coast Guard (USCG) allow equipment (e.g., a tidal energy turbine) in the main portion of the channel beneath the bridge?

Report of the Sub-committee on Technical Feasibility and Cost

This report is structured to represent the work and findings of this subcommittee. There was a list of charges which the subcommittee needed to address. This list is displayed on the previous page. The main body of this report is formatted to begin with a brief background on the site at the General Sullivan Bridge. This is followed by a discussion of US Coast Guard concerns in the navigable water ways (found in **Section IV, B**) and a presentation of the vendor activity (found in **Appendix 5**). The report ends with a discussion of the salient issue, ‘how much power is available at the General Sullivan Bridge’. This section provides a preliminary estimate of power production at the site. An economic estimate is difficult at this point as there are numerous data lacking to produce reliable numbers. The last section has a tutorial edge to it defining the complexity of the site and the flow regime. Footnotes and references noted in this section are listed at the end of this section.

“The conversion of ocean energy (ocean currents off continental shelf, tidal currents, or wave energy) is believed to be one of the more environmentally benign ways to generate electricity. Ocean energy entrepreneurs have begun to offer various designs, covering a wide range of physical arrangements and energy conversion mechanisms (1, 2, 3). Some of these ocean energy devices exist only on the drawing board or as scale models, several have been installed in pilot scale trials, and some are already deployed in actual energy production settings (e.g., Verdant Power’s Roosevelt Island Tidal Energy (RITE) project). *However, it appears that the science and technology of ocean current and wave energy devices is lagging somewhat behind the entrepreneurial spirit.* Prototype testing has seen some setbacks and even failures that can be traced to insufficient knowledge of the flow field around ocean turbines, in particular fluid-structure interaction, debris loading and unsteady forces transmitted to the turbine foundation/anchoring.” (4)

Background

“New England is literally at the end of the country’s natural gas pipeline network, has no oil refineries located in the region, is twice as dependent on oil for heating homes as the rest of the nation, and has relied almost exclusively on natural gas facilities for newly-built electric generating capacity in the past decade. Five of the six New England states are among the nation’s eight most expensive states from an energy price and expenditure point of view. . . Except for wind, some other local renewable resources and some opportunities to “mine” inefficient uses of energy locally, New England is a region with virtually no indigenous energy resources.” (5).

New England’s demand for electric power is growing at 1.5 percent per year. In addition, recent newspaper reports have warned of possible rolling blackouts, due to a shortage of natural gas for electrical power generation. The Analysis Group report for the New England Energy Alliance forecast a shortage of electrical generation capacity as early as 2008 and will affect the economic growth of the region by 2010. Yet within all of New England there is only one new electrical generation capability being planned - the

controversial Cape Wind project for a wind farm offshore of Cape Cod (6,7). This project appears to have significant opposition based on aesthetics (wind farms are ugly), reliability (wind can be fickle), environmental (hazard to migrating birds) and cost (pricey offshore platforms for each wind generator).

The Little Bay - General Sullivan Bridges Site

The 15-mile long estuary of the Piscataqua River, Little Bay and Great Bay in New Hampshire has about 10,000 surface acres of water. The narrow channel under the Little Bay bridges between Bloody Point in Newington and Hilton Point in Dover is 1,484 feet wide with a river vertical cross-section of 23,689 square feet – or .54 Acre (8). Upstream of this chokepoint is a tidal prism consisting of 5,696 surface acres of water that normally rise and fall 6.4 feet twice a day (9). Here and at several other narrow points in the river the tide reaches speeds up to 5 knots. This is one of the fastest tidal currents in commercially navigable waters in North America.

The Piscataqua River's "friction" reduces the 10-foot ocean tides at the mouth to a normal rise/fall of 6.4 feet at the bridges. The momentum of this volume of water through the hydraulic friction carries the currents 1 1/2 hours past the turning points of the tide at the river mouth and slightly over two hours at the bridges. As a result, there is only slack water for ten minutes before the current changes direction (10).

The Little Bay Bridges

There are two existing bridges at the proposed generation site: the four-lane concrete Little Bay Bridges and the General Sullivan steel truss bridge (the smaller bridge to the right in Figure 1). The latter was built in the 1930s and is no longer bearing traffic, but will be rehabilitated for historical reasons and for recreational use. The state plans to extend the width of the Little Bay Bridges westward (toward the General Sullivan) to increase the four-lane bridge with no shoulders into an eight-lane bridge with shoulders on the outboard edges. This plan will expand the Little Bay Bridges to within 15 feet of the old bridge and would tremendously increase the turbulence between the two. To reduce the turbulence the footings of the new bridge will be extended to combine the two existing concrete piers, the three new concrete piers and the old stone pier of the General Sullivan Bridge at eight different stations across the strait. Each of these eight combined footings will be just over 200 feet long aligned nearly parallel with the current (11). These 200-foot-long footings, plus the bridge piers themselves are potential infrastructure beneath the bridges for mounting current-driven electrical generation devices.

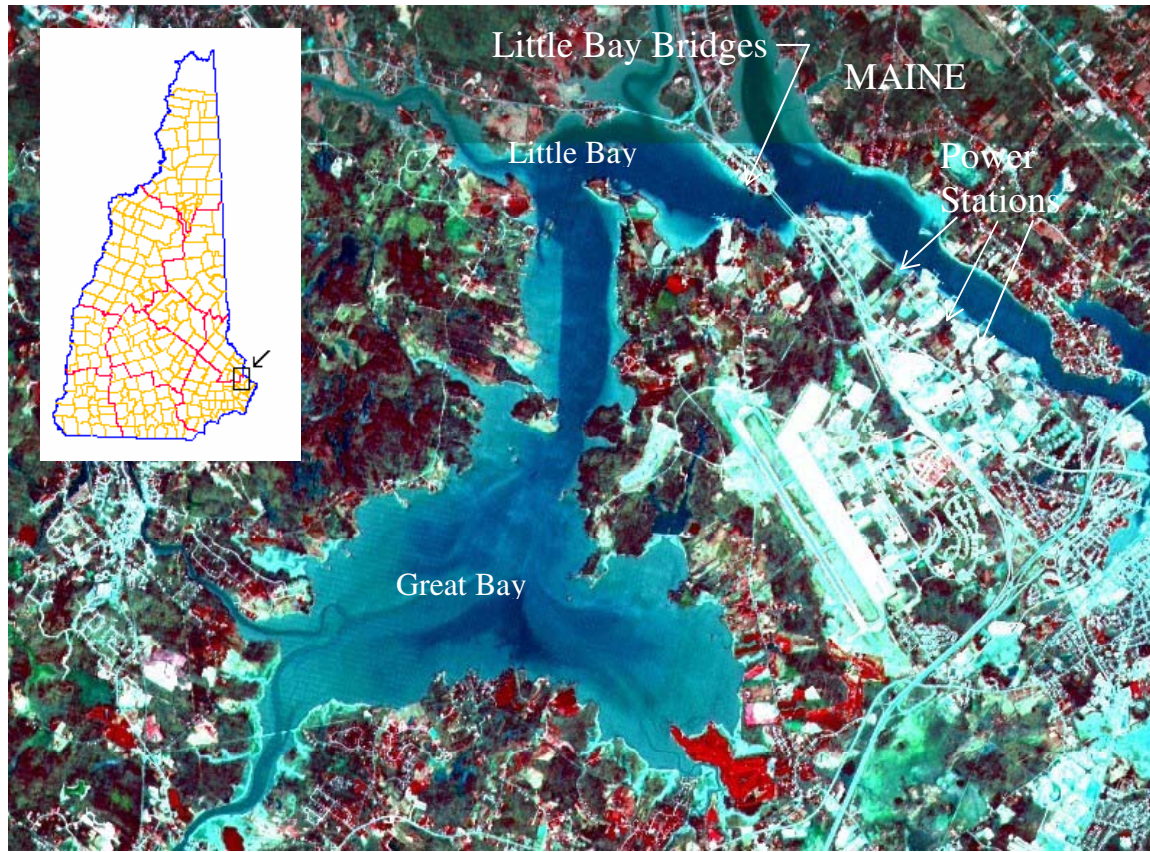


Figure 1. Bird's eye view of the General Sullivan Bridge, Little Bay, Great Bay and the Piscataqua River

How much power:

This topic requires consideration of the fundamental equation for power per unit area, or power density,

$$\text{Power density} = \frac{1}{2} \rho U_c^3$$

where U_c is the current speed, and ρ is the density of the water. This equation is actually power density as the resulting units are watts/meter². So power available is

$$\text{Power Available} = \frac{1}{2} \rho U_c^3 m^2.$$

There are three basic parameters here:

ρ : fluid density : constant

U_c : Current speed : a function of (space, time)

m^2 : cross-sectional area.

Density

The density is fundamentally constant. The density at the General Sullivan Bridge ranges from a high value of approximately 1025 kg/m^3 during dry spells to a low value of 1005 kg/m^3 during wet spells when there is typically more fresh water introduced into the estuarine system. All the major rivers contributing fresh water to the estuary have dams on them so during dry spells a minimum of fresh water enters the estuary. The second basic consideration of this estuary comes from the fact that it is tidally driven. The water column is considered to be vertically-mixed hence the density from the surface to the bottom is effectively constant. These salient points about the estuarine circulation effectively render the density constant. For the purpose of comparative calculations further in this report a density value of 1025 kg/m^3 was used.

Area

This parameter invited several questions concerning what exactly is the value used in the power available estimate. The entire cross-section was used to provide an estimate of naturally available power. But the entire cross-section area is not useable due to navigation concerns, some of it being inter-tidal or some of it being just too shallow. The area can be further restricted by the cross-sectional area presented to the flow by the power extraction device and what is the spacing at which these devices can be deployed and be efficient. These issues also need to be considered in the context of the spatial distribution of the current speed.

The overall cross-section area under the General Sullivan Bridge is well documented in the new bridge design study (11). There was also a study of the currents in the Great Bay Estuary System during the summer 2007 (12). These two studies provide insight into the power naturally available and at the same time provide insight into the limitations of the General Sullivan Bridge site for tidal power generation. Where in the cross section area is there ample current speed is the concern.

Current speed

This parameter in the power equation has significant influence on the result as it is cubed. This parameter has created all the interest in this site for power generation. Many have experienced the swift moving water under the bridge or maybe even let a 'drifter' go in the flow to see how fast it was moving. Other more sophisticated means of measuring these speeds were deployed for many studies in the estuary in general. The most recent study was that of Kammerer from NOAA/UNH (12). The most complete earlier study was done in 1976 in a coordinated effort between UNH faculty and NOAA using the NOAA ship Ferrell. The 1976 study deployed current meters and tide gauges at critical points in the estuary and time series data were recorded. These data were used to develop and calibrate the first hydrodynamic computational models of the estuary. These models have evolved as the computational capabilities evolved. The paper by Swift and Brown (13) is the benchmark document for calculating the tide level and current speeds in the estuary. These types of models are the source of the tidal power data presented in the EPRI report on tidal power Hagerman and Bedard 2006 (14). Nobody to date has performed a comprehensive current study under the General Sullivan Bridge. A single transect is available from another source which will be presented later in this report.

There are two basic questions concerning the current speed in the context of tidal power generation. These questions concern the fact that U_c is a function of time and space.

1. At what point in the tidal cycle does U_c become greater than 1 m/sec (2 knots) or 2m/sec (4 knots)? The 1 m/sec speed is considered the minimum speed to have a power extraction device operate. This is the time dependency.
2. Where in the cross-section do these U_c values exist? This is the spatial dependency.

The answer to question 1 has a couple of approaches. The first is a basic approach founded on the observation that the flow under the bridge as a function of time is approximately a “square wave.” An ideal square wave starts at time zero and amplitude zero and then goes to maximum amplitude instantaneously (Figure 2). It continues at maximum amplitude to a prescribed time then instantaneously goes to maximum negative amplitude for the same prescribed period of time at which it goes instantaneously to maximum positive amplitude. This process repeats. The prescribed period in this case is the 12 hours 28 minutes of the tidal cycle. The transition from maximum positive amplitude to maximum negative amplitude occurs at the change from flood to ebb tide and vice versa. First order calculations of power density are based on this model with the max/min amplitude being in the flood or ebb current speed.

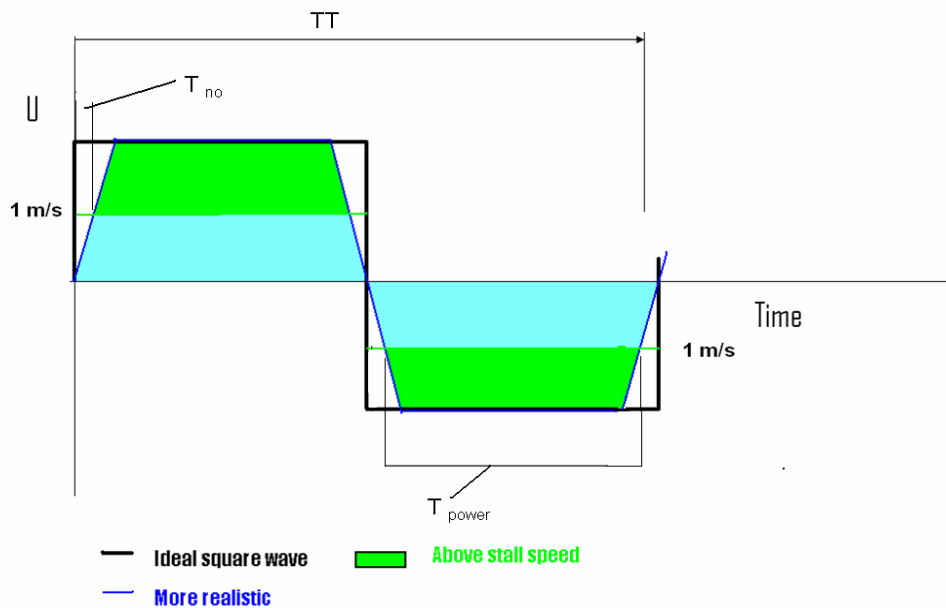


Figure 2. Graphical presentation of the ideal square wave model and a more realistic perturbation of it.

A more realistic estimate of the U_c over time is a perturbation of this ideal square wave model. The point to note here is that the difference between TT and $2T_{\text{power}}$ is when power is not readily available or

$$TT - 2 T_{\text{power}} = 4T_{\text{no}}$$

The EPRI report provides estimates of U_c with the histograms of how frequently the required U_c is achieved at a specific site over a one year timeframe. These estimates are based on two dimensional hydrodynamic models which have vertically averaged current speeds, not local comprehensive measurements. These approaches assume a value of U_c which is constant with depth. This brings the discussion to question (2).

Present current measuring technology enables an “instantaneous picture” of the current velocity as a function of depth. The Acoustic Doppler Current Profiler (ADCP) is the instrument which enables these data to be acquired. A simple primer on the ADCP is presented.

The ADCP can provide detailed data regarding the spatial and temporal variation of currents. These data enable a more complete, comprehensive evaluation of flow at the point of ADCP deployment, if the device is bottom moored. The ADCP is also capable of being mounted on a vessel and operating while the vessel is underway. The ADCP provides a method for observing events which are prevalent for a longer time frame or to provide estimates of parameters such as volume flow through a cross-section. They are remarkable devices, but as with all instruments one must understand the physical principles involved in their operation to understand the data.

The ADCP operates on the Doppler Principle which defines the change in frequency of a sound as a function of the relative speed of the source and receiver, and the direction of their motion with respect to one another. The change in frequency increases as the source and receiver move closer to each other, and decrease as they move away from each other. This change in Acoustic frequency is related to velocity. The ADCP uses this principle to measure the xyz components of U_c at specific depths. There are four acoustic transducers which emit a known acoustic signal. The sound propagates away from the transducer, but some of the signal is reflected back towards the transducers from “debris” which is moving with the flow. This signal is received over time by the same transducer which transmitted the signal. The receive signal is divided into “cells” or “bins” in time which actually represent depth increments (Figure 3).

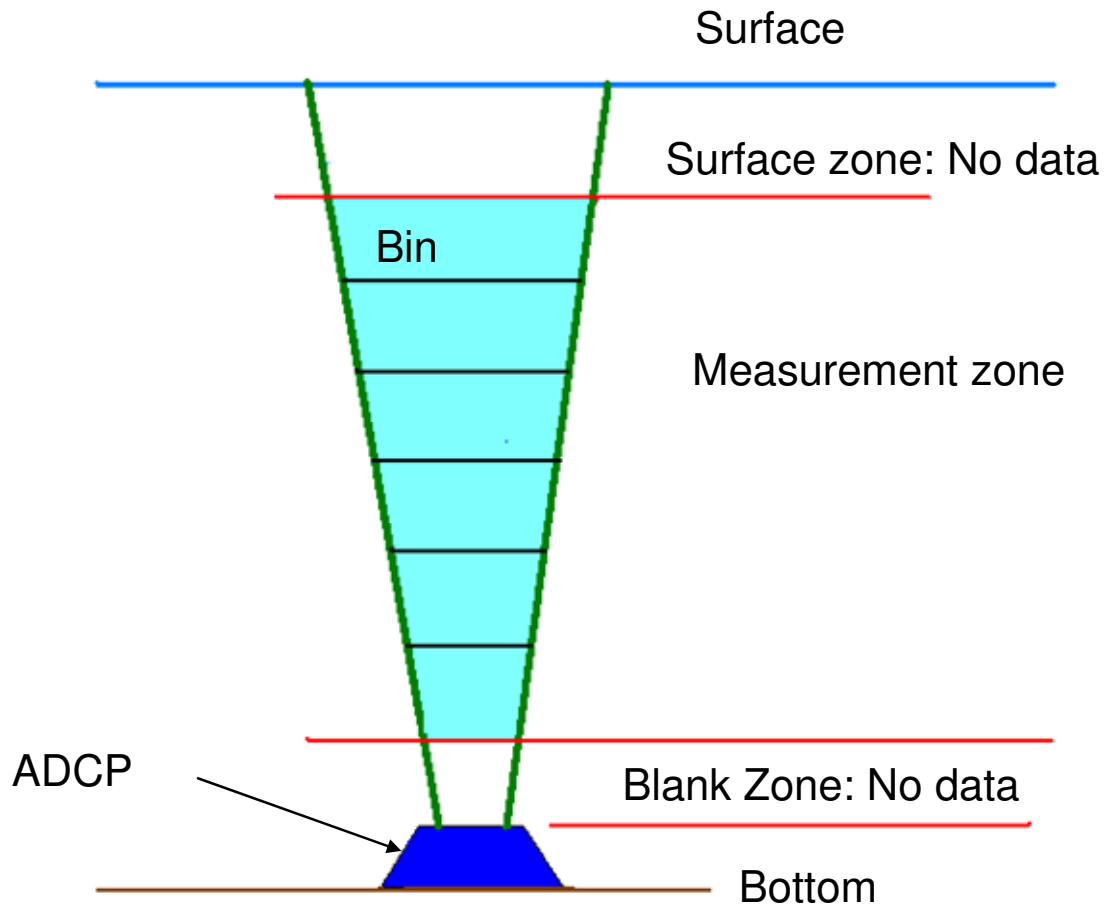


Figure 3. Schematic of the ADCP data qualification as a function of depth.

Each ping presents a vertical profile of U_c averaged over the bin time. The data are remarkable because the ping rate can be fast which enables one to watch the changes with time. There are physical concerns which qualify these U_c values. These are addressed in the context of a bottom mounted ADCP as this is the basic configuration used in the present data.

The bottom mount places the ADCP transducers approximately 0.75 meters off the bottom. The Blank Zone, which is related to the 'ping length' is also normally 0.75 meters. The bottom 1.5 meters of the water column are therefore not measured. The surface zone is another 'depth' increment which is not measured due to an undesired acoustic interference. This surface zone can be up to 1.5 meters. Only the interior of the water column is measured.

The data acquired in the summer 2008 study were from bottom mounted ADCP. These provide a history of what was happening to the flow directly above the device, and nowhere else. This is the limit of the bottom mounted device for measuring the desired current speed across the cross-section.

The vertical velocity profiles from an ADCP deployed near the General Sullivan Bridge show the change in the current speed with depth over half of a tide cycle, Figure 4. The point to note is that the requisite 1 m/s speed to have turbines spin is achieved from mid-water to the surface over a portion of the tide cycle. These data indicate that only a portion of the cross-section area is available for power extraction.

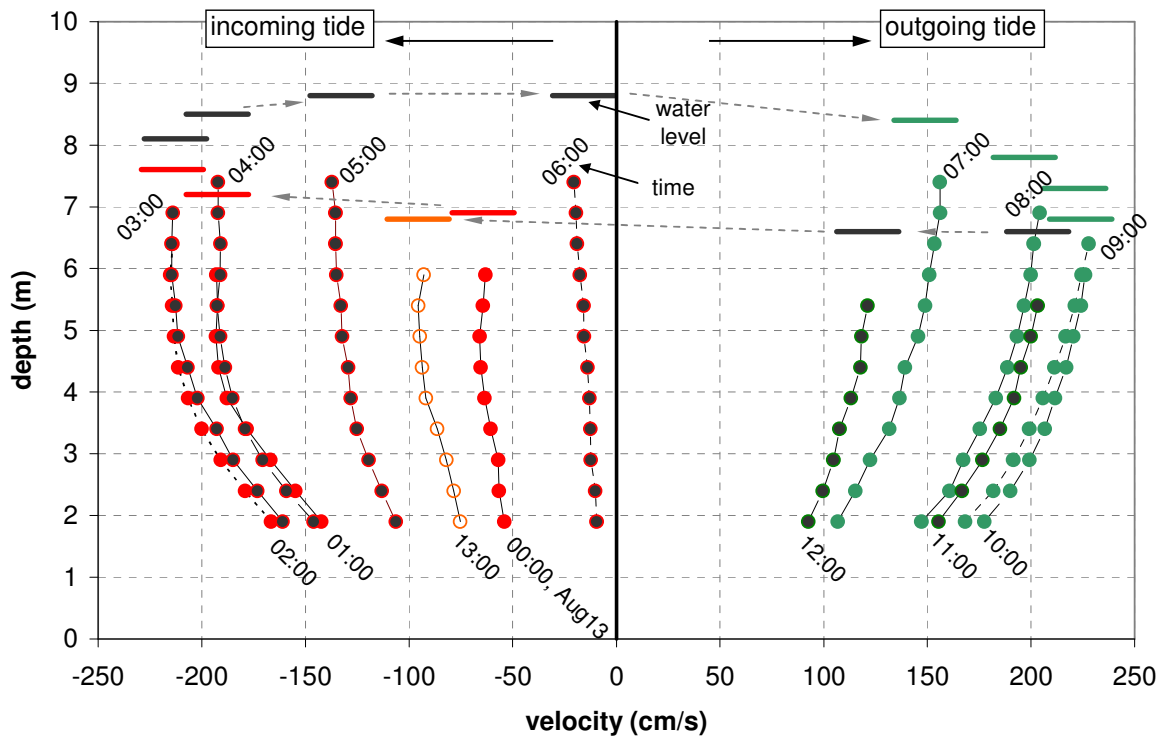


Figure 4. Current speed is plotted as a function of depth over a tide cycle near the General Sullivan Bridge. Note the 100cm/s (1m/s) line on the velocity axis, the changing water level and the portion of the depth where this velocity is available.

A plot of an ADCP record acquired from a small boat which traversed the section south of the General Sullivan Bridge is shown in Figure 5. This is a single cross-section and as such represent a 'point in time'. The cross-section current speed data shown in Figure 5 indicate that a large portion of the cross-section has a speed which is above the 1m/sec (Green) at this point in time. These data also indicate that a smaller portion of the cross-section is in the 2 m/s range (Red) at this point in time. The red area is better for extracting power, but happens only in a small area. Several of these traverses would be necessary to gain the requisite understanding of the tidal dynamics under the General Sullivan Bridge.

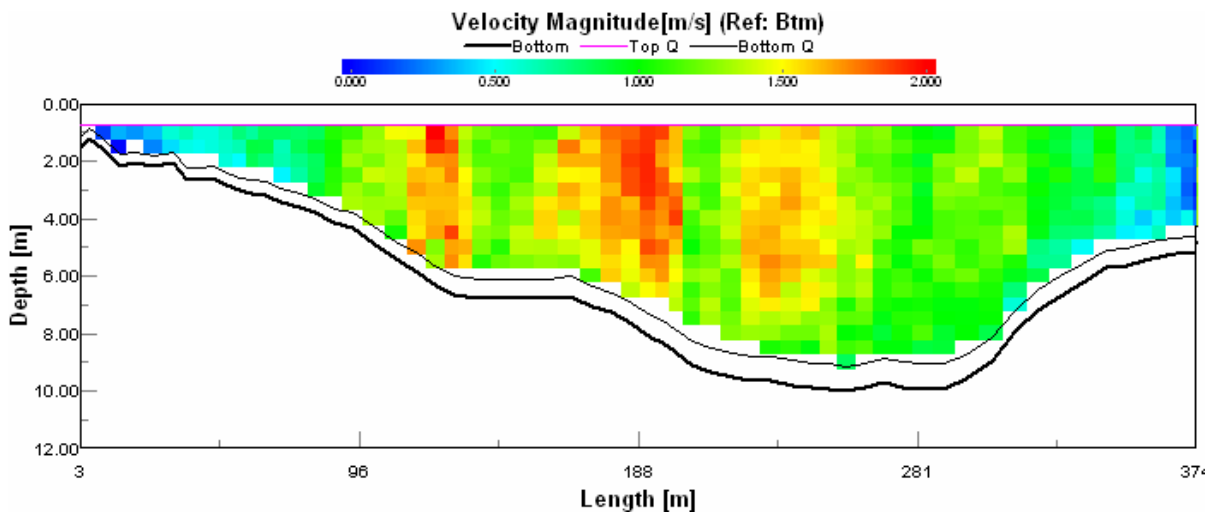


Figure 5. A single ADCP record obtained across the channel at the General Sullivan Bridge indicating the limited cross-sectional area with the requisite current speed.

Dover Point Power Estimate(s)

There are different approaches presented here to show the differences in power estimates. The first is based on a memo by Professor Swift from UNH on estimating the power available at the bridge. Professor Swift has been active in modeling and measurement programs on the Great Bay Estuary since the mid 1970's.

$$\text{Power} = 1/2 \rho U^3 * \text{Area} * (0.15)$$

Power : watts

ρ : fluid density; 1025 kg/m³

U: fluid speed; m/second

Area: cross-sectional area under the bridges; m²

(0.15): represents the 15 % which is the rule of thumb for how much power one can extract without significant impact on the existing tidal flow characteristics, upstream or downstream

Assumptions: $U_{ave} = 2$ m/s, approximately 4 knots

“Square wave’ over the tidal cycle

Area: 2000 m²

$$\text{Power} = 1/2 (2\text{m/s})^3 1025 \text{ kg/m}^3 (2000 \text{ m}^2) (0.15) = 1,230,000 \text{ watts}$$

EPRI Estimate

The EPRI report (14) provides an estimate from data at another site (where located?) in the estuary which has a similar cross-section area. From Figure 3.10-2 at 2.1 m/s, the Tidal Stream Power Density (watts/ m²) = 4,746.3

$$\text{Power} = (4746.3 \text{ watts/ m}^2) (2000 \text{ m}^2) (0.15) = 1,423,890 \text{ watts}$$

Annual Average Power Density is presented as 1.482 kW/m² in the EPRI report. Using this value the power is,

$$\text{Power} = (1482 \text{ watts/ m}^2) (2000 \text{ m}^2) (0.15) = 444,600 \text{ watts}$$

This Annual Average Power Density is based on the distribution of current speeds over the tidal cycle, and is based on a cross section area of 2300 m².

The interesting point to gather from the EPRI report is the percent of time the current speeds are above the two knot value where turbines work best. From the histogram that is presented, the requisite speed is reached only 58.5 % of the time. All of these estimates are valid and could be further refined with more specific current speed information.

UNH Estimate: This value is based on 2300 m² area as in the EPRI report.

$$\text{Power} = \frac{1}{2} (2\text{m/s})^3 1025 \text{ kg/m}^3 (2300 \text{ m}^2) (0.15) = 1,414,500 \text{ watts}$$

EPRI Estimate

$$\text{Power} = (4746.3 \text{ watts/ m}^2) (2300 \text{ m}^2) (0.15) = 1,637,473 \text{ watts}$$

$$\text{Power} = (1482 \text{ watts/ m}^2) (2300 \text{ m}^2) (0.15) = 511,290 \text{ watts}$$

The estimated cross section area of the estuary at the bridges is presented in the bridge study to be 2140 m² which again would change the numbers only marginally.

The significant question is the meaning of the statement that, *15% of the naturally available energy can be extracted from the flow* (1). What does naturally available mean? Is it as was assumed above, 15% of the flow through the cross-section? Or if the cross-section is such that a smaller percentage of it is naturally available due to its bottom contours, does one just consider the smaller cross-section and take 15% of it? This would drastically reduce the amount available. When one looks carefully at the cross-section under the bridges there is approximately 43 % of the area available for deploying gear due to the bottom topography. The area closest to the land on each side is too shallow,

while the center span is not available due to navigation issues. This leaves two spans where there is ample water depth and most likely no conflict with navigation.

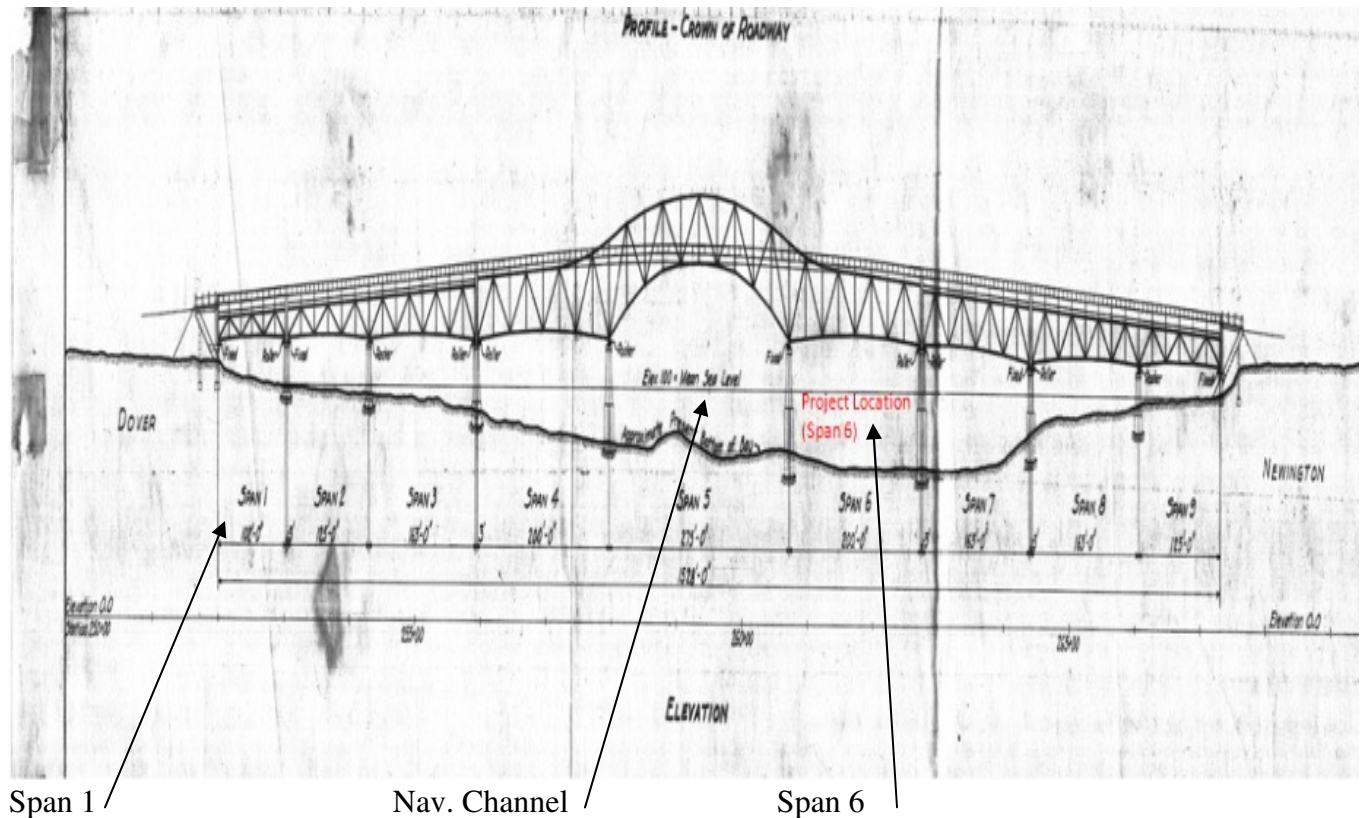


Figure 6. The General Sullivan Bridge span with the mean low water line. There are nine spans beginning on the left of the figure, the Dover side. Spans 1-4 are not available for tidal energy generation due to shallow water depth. Span 5, the middle section with the arch is the navigation channel. Span 6 and part of span 7 are useable for tidal power due to reasonable depth. Spans 8 and 9 are again too shallow.

The above calculations provide a range of estimates of what is naturally available when considering the entire cross-section. The question now reduces to the following; can one extract this amount, 15%, from the available cross-section? And as a corollary is there ample current speed in these areas to have the turbines operate efficiently? A temporal representation of the current speed profile from the ADCP records shown in Figures 4 and 5 in the vicinity of the bridge provides insight to where and when the necessary current speed is available. There is a reduced area where adequate speed is achieved over long periods of time. How this speed changes with space and time is only known in a general sense, detailed data are lacking. The preliminary data indicate that the cross-section for power extraction is a small fraction of the total cross-section. Consider this with the need for most devices to be up to two (2) meters below the surface to operate properly, the bottom boundary layer of up to 1.5 meters and there remains a smaller area with adequate speed for generating power.

This said the site does appear to have adequate flow available to render it a unique site for a benchmark testing facility for tidal power extraction devices. The site has limited space for serious commercial build-out of power generation even though it appears to be otherwise. The General Sullivan Bridge site could easily be developed into a first class benchmark testing facility for tidal energy research and development. There is need to develop such sites to provide more realistic, larger than laboratory model, testing of devices which show promise. This site could be a critical place for the careful engineering development and testing which needs to happen.

Subcommittee Summary

The general conclusion of the Subcommittee's work is that the industry is still in the embryonic stage and hence a definitive assessment of the issue of tidal energy extraction at the General Sullivan Bridge is premature. There is a stream of fast moving water under the bridge on both the flood and ebb tides, and the flow is fairly well understood. Beyond this the amount of energy which can be extracted from a flow is a consequence of the particular technology available and how it is deployed. To date there is a paucity of data available on 'water to wire' efficiencies for specific energy extraction devices.

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- (2) Technology Evaluation of Existing and Emerging Technologies Water Current Turbines – Natural Resources Canada report NRCan-06-01071. Prepared by Verdant Power Canada (2006)
- (3) Westwood A (2004), Wave and Tidal Energy Review, in ReFocus, 50-55, Sep-Oct 2004, Elsevier.
- (4) Martin Wosnik , Chris White, Ken Baldwin, Rob Swift, Igor Tsukrov, David Gress, Michael Carter, Gordon Kraft, and Barbaros Celikkol, *Design Criteria and Standards for Viable Wave and Ocean Current Energy Generating Devices*, A White Paper submitted to the Minerals Management Service, March 2008
- (5) New England Energy Alliance to Issue Report on Challenges for Regional Energy Infrastructure
http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20051108006052&newsLang=en
and
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(6) WMUR Channel 9 Nov 27, 2005

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Alliance -regarding the above (1) report.

(7) Cape Wind-- OffShore Wind Energy- Cape Cod, MA

<http://www.capewind.org/>

(8) B-size Xerox copies of plans for Little Bay Bridges - NH State Project P7041-A
General Plan and Elevation drawings
Location Plan and Borings Logs

(9) NOAA Magazine article on the ecology of the Great Bay estuary.

<http://www.magazine.noaa.gov/stories/mag122.htm>

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PROPOSED NEWINGTON NUCLEAR December, 1969

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<http://www.newington-dover.com/documents.shtml>

(12) Kammerer, C., Personal Communication, *C-MIST Current Data Analysis (PIRO 710) Piscataqua River Current Survey, General Sullivan Bridge 2007.*

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(14) Hagerman, G. and Bedard, R., *Maine Tidal In-Stream Energy Conversion: Survey and Characterization of Potential Sites*, EPRI – TP -003 ME Rev 1, 02 October 2006.

Section IV: Legal Issues

A. Report to Commission by NH Attorney General's Office

At the December 7, 2007 NH Tidal Energy Commission meeting, Commission members posed several questions to Evan Mulholland, Staff Attorney from the NH Department of Justice. The questions and Mr. Mulholland's answers to NH Tidal Energy Commission are documented below:

Question 1: *Does the state have to negotiate exclusively with NH Tidal Energy Company because FERC has granted it a preliminary permit for the area under the General Sullivan and Little Bay Bridges, or could the state negotiate with another vendor?*

Answer 1: Yes. At this point any negotiations the state wants to enter into must include NH Tidal Energy Company for the areas in which it has a preliminary permit from FERC. (See Map of NHTEC Permit Area attached to this document.) Until NH Tidal Energy Corp.'s preliminary permit lapses, it has the exclusive right to conduct assessments in these areas. The other permittee, UEK Corp., has a preliminary permit from FERC to conduct assessments in two areas around the I-95 Bridge. (See Map of UEK Permit Area also attached to this document.). The rights held by a preliminary permit holder are described in the following excerpt:

"A preliminary permit holder can ... prevent development of a site by others. A preliminary permit confers several rights: (1) only the permittee can file a license application for the project during the permit term; (2) the permittee has the right to amend its license application to make it as well adapted as a later-filed competing license application (right of last amendment); and (3) the permittee's application will be selected over a competitor's if both are equally well adapted." *Mt. Hope Waterpower Project LLP*, 116 FERC ¶ 61,232 (2006)

Question 2: *Who would be the primary contact for companies proposing a lease?*

Answer 2: The State owns the bed of the Pisataqua River estuary. RSA 1:16; 482-A:4; *Opinion of the Justices*, 139 N.H. 82 (1994) ("[T]he public trust in tidewaters in this State extends landward to the high water mark."). Any transfer of title to submerged lands requires an act of the legislature. But see RSA 4:40 (providing for the disposal by sale of state-owned real estate without legislative approval); RSA 4:40-a (permitting the governor and council to approve the sale of sand or gravel from the bed of a great pond). 96 nh 141 (bed)

Question 3: *What is FERC's competing application process?*

Answer 3: FERC allows "competing applications" to be submitted for FERC licenses for a specific project or site. As described in (1) above, the holder of a preliminary FREC permit has the first priority in applying for a license for the project that is being studied. This means that an application properly filed with FERC by a preliminary permit holder (also called the "priority applicant") is favored by FERC when compared against a competing application that is equally or less "well adapted to develop, conserve, and

utilize in the public interest the water resources of the region, taking into consideration the ability of each applicant to carry out its plans.” 18 CFR § 4.37(c)(1).

When the competing application (i.e., the non-priority applicant) is judged by FERC to be better adapted than the priority applicant, FERC is required to inform the priority applicant of his application’s deficiencies and permit him to amend his application. 18 CFR § 4.37(c)(2). If the priority applicant successfully amends his application so that it meets or exceeds the competing application, FERC will favor the priority applicant’s application.

Finally, if there is no priority applicant (because the preliminary permit holder did not submit a license application or failed to meet the conditions of his permit) FERC judges competing applications according to the following:

- A) If both or neither of two applicants are municipalities or towns, FERC favors the application that is better adapted. 18 CFR § 4.37(b)(1).
- B) If both or neither of two applicants are municipalities or towns and their plans are equally well adapted, FERC favors the applicant with the earliest application acceptance date. 18 CFR § 4.37(b)(2).
- C) If one of two applicants is a municipality or state, and the other is not, and the municipality’s or state’s application is at least as well adapted, FERC favors the municipality or state. 18 CFR § 4.37(b)(3).

If one of two applicants is a municipality or state, and the other is not, and the application of the non-state /non-municipality applicant is better adapted, then FERC is required to inform the municipality or state of its application’s deficiencies and permit it to amend his application. 18 CFR § 4.37(b)(4).

Question 4: *What is the nature of the taxes for Seabrook Station?*

Answer 4: Seabrook Station is taxed by the Town of Seabrook pursuant to RSA 72:8. The Station is liable to the town for municipal tax, local education tax and county tax based on the Station’s value as assessed by the Town. The Station also pays into the State Education Fund pursuant to RSA 83-F (Utility Property Tax). The State reassesses the value of the property and plant every year. In addition, Seabrook Station is subject to the Business Enterprise Tax.

Question 5: *Do existing statutes provide the authority for state agencies to deny access of FERC permit holders, or others, to locate equipment within a specified distance from the bridges in order to preserve work areas or security zones?*

Answer 5: Currently, the NH Department of Transportation enters into written agreements with utilities and telecommunication companies that allow the placement of conduits along bridges in the state. These agreements contain specific provisions that describe the state’s authority if any conflict arises between the state’s need to repair or protect the structure and the company’s use of the structure. I anticipate that any agreement between the Department of Transportation and any tidal energy company would include similar provisions.

However, as described in Answer 6 (below), a state cannot veto a project licensed by FERC. If a licensee cannot comply with both state and federal law, the state law is preempted. That said, I expect that any concerns of the NH Department of Transportation (as well as of the US Department of Homeland Security) will be addressed during the administrative process through which a potential FERC licensee would be granted a license. Pursuant to Section 10 of the Federal Power Act, before granting a license, FERC must consider the: “recommendations of Federal and State agencies exercising administration over flood control, navigation, irrigation, recreation, cultural and other relevant resources of the State in which the project is located, and the recommendations (including fish and wildlife recommendations) of Indian tribes affected by the project.” 16 U.S.C. § 803(a).

The following question resulted from discussions at subsequent Commission meetings:

Question 6: *RSA 236:18 states that: “The state shall have exclusive rights, insofar as they do not conflict with any federal statute, to build into, lease or utilize for any public purpose the air space directly above or below the toll highways and the interstate system highways within this state. These rights to said air space shall extend upward or downward so far as is practical and reasonable for all purposes of the state and it shall be unlawful for any person or persons to violate said air space except as allowed by the state. The department of transportation shall be responsible for the administration and enforcement of this section. Nothing in this section shall be construed as prohibiting aircraft from flying through the air space above the herein mentioned highways. Notwithstanding the foregoing, public utilities shall have the right to erect lines through said air space in accordance with the provisions of this chapter relative thereto.*

A. Does this statute, or others, establish within the NHDOT the authority to lease the submerged lands beneath the Little Bay – General Sullivan bridges or to sell the right to make attachments to the bridges’ substructure?

Answer 6A: RSA 236:18 prohibits a private entity from using the air space directly above or below a toll highway or an interstate highway without permission or a lease from the Department of Transportation. By implication, the Department of Transportation would administer any lease between the state and a private entity for the right to attach a structure to a bridge abutment, whether above or below the water’s surface.

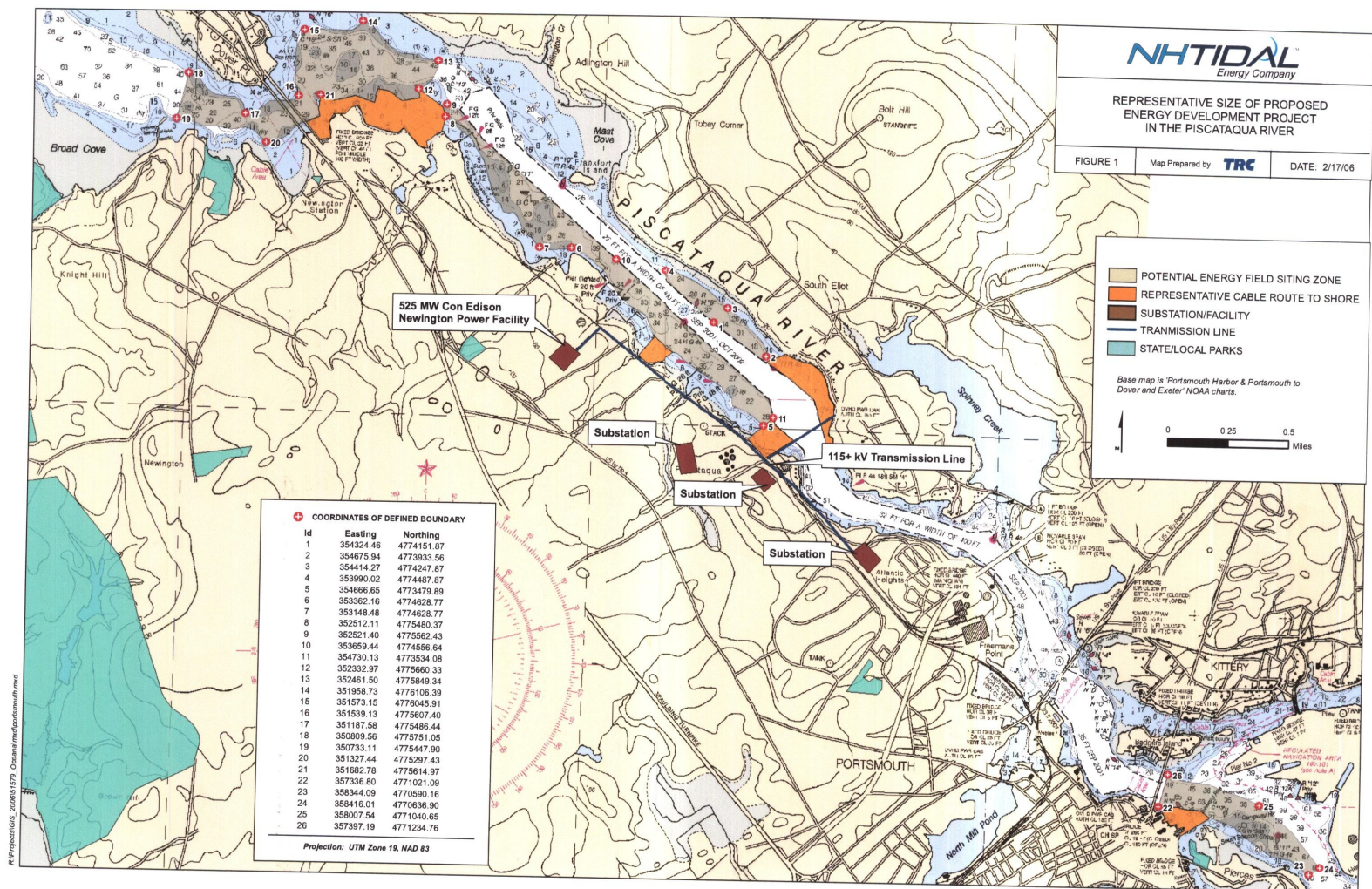
The authority to lease submerged land is less clear. As indicated above in question two, the state owns the submerged land below the Piscataqua River. A transfer of title would require an act of the legislature, but it is not clearly set forth by statute whether any agency could negotiate and execute a lease of state-owned submerged land.

B. Would a FERC permit constitute a Federal pre-emption of this statute?

Answer 6B: No. Under RSA 236:18, the state can only claim a right to control the airspace above or below toll highways and interstate highways to the extent that the right

does not conflict with federal law. In other words, the section already contemplates that federal law may restrict the state's right to control these airspaces.

More generally, it would be difficult for the state to prohibit an entity that held a license from FERC to install a hydrokinetic facility on the bed of the Piscataqua from installing that facility. A state cannot veto a project licensed by FERC. However if any land is condemned by the licensee pursuant to the federal eminent domain power, compensation is required.



Public 060410-0111-001

ORIGINAL

UEK Corporation

Box 3124 Annapolis
Maryland 21403-3124

Honorable Magalie Salas
Secretary
Federal Energy Regulatory Commission
888 First Street, NE, Room 1-A
Washington, District of Columbia 20426

July 28, 2006

P-12722-000

Reference: Preliminary Permit Application
-Piscataqua Tidal Hydrokinetic Energy Project-
ID No.: P-12664

Dear Ms. Salas,

On behalf of UEK Corporation Maryland, we are pleased to submit for filing an original and eight (8) copies of an Application for a Preliminary Permit for tidal sites situated on the Piscataqua River running between the State of New Hampshire and the State of Maine in the vicinity of the City of Portsmouth, NH.

Upon grant of a Preliminary Permit, UEK Corporation will conduct resource confirmation throughout the full site area with a tidal UEK@System mounted on a special catamaran survey platform. This unit is used as an "instrument" and is not designed to become a permanent part of the project. Immediately following confirmation, a site specific Pilot UEK@System will be installed according to the terms of the preliminary permit and interconnected to a load box or to the Utility grid.

We believe this non-intrusive, clean and renewable technology will help relieve dependence on fuel derived energy sources and improve the quality of life within the sites surrounding communities.

Please, do not hesitate to contact us for more information if the need arises.

Respectfully yours,



Philippe Vauthier

President

UEK Corporation

ph.vauthier@uekus.com

B. US Coast Guard Requirements RE: Impediments to Navigation

USCG Bridge Permits

The US Coast Guard bridge division was represented at two Tidal Commission meetings by Commander Gary Cassof – Officer in Charge, USCG Bridge Administration Division (CG-5411) District 1. He also represented the USCG to the NHDOT Little Bay Bridges Advisory Task Force meetings. During those meetings it was established that the USCG would concur with, and issue a bridge permit for, the new bridge profile matching the same vertical clearance and channel width of the existing bridges. In an email discussing those DOT meetings he also stated “the USCG is interested in channel depths and the ability for the channel depth to be self-maintained. It is the USCG’s responsibility to ensure that any bridge alternative does not preclude future use of the waterway.”

When contacted later by a member of the Tidal Technical Subcommittee Cdr. Cassof said that officially, the Bridge Division did not have a charter to rule on the depth, obstructions or bottom profile under a bridge when issuing a bridge permit – only the marked channel width and vertical clearance. Obstructions to depth are handled by the Marine Safety Office (MSO)

Contact:

Mr. Gary Kassof
Commander, First Coast Guard District (dpb)
Bridge Administration Division (CG-5411)
Battery Park Building
One South Street
New York, NY 10004-1466
Gary.Kassof@USCG.mil
www.uscg.mil/hq/cg5/cg5411/District.asp
212/668-7021

Re: US Army Corps of Engineers

Cdr. Cassof also believed that since the Little Bay Bridges are inland of the commercial navigation channel and are not near to another USCoE project (such as the dredging of the Cocheco River in Dover) the USCoE would *not be involved* with permitting tidal generation equipment as underwater obstructions under the Little Bay Bridges. This was his unofficial opinion – not an official position of the USCoE. There may also be other factors requiring USCoE permits.

USCG Marine Safety Office

The permitting office for putting obstructions in the water under the Little Bay Bridges is the Northern New England Sector Office of the USCG Marine Safety Office (MSO) in Portland, Maine. There is also an MSO office in the USCG Station at Newcastle, but the decisions and the permits for obstructions come from Portland. The MSO position for tidal equipment as underwater obstructions near or under the bridges is as follows:

Tidal Equipment Mooring Construction

After construction of the new LBB bridge piers, the placement (for up to 5 years) of underwater tidal electric generation equipment and monitoring gear in the underwater spaces between piers 2, 3 and 4 with a minimum depth of 5 feet below MLLW. Only small motor boat traffic can fit under the 20-foot clearance of the GSB approach girders. Generation and monitoring equipment are planned to be fastened to posts anchored in the bedrock. *For all long term in-water tidal generation activities around the bridges the MSO wants to be notified in writing of the start/end dates and nature of the activity. This will permit the MSO to put that information into the Local Notice to Mariners.*

Barges or Boats

In 2009 and 2010 a barge is planned to be attached to various GSB piers (2, 3 or the inside of 4 away from navigation channel) for several sessions of a few months duration during the ice-free season. *This requires notification for the Local Notice to Mariners as above.* Small tethered boats or floats may also be required for survey and instrumentation of the bridge site. *The MSO wants to be notified when maintenance requiring a boat or float to be on scene for an extended period of time so the MSO can put out a broadcast advising the mariners in the area.*

Controlling Depth

Under or near any bridge piers for the GSB and LBBs that align with the GSB truss girder sections, tidal generation equipment and instrumentation 5 feet below Mean Lower Low Water (MLLW) is acceptable.

In the main navigation channel between the GSB and LBB piers 4 and 5, the controlling depth is set to 18 feet MLLW by the bedrock on the Dover side. Obstructions may be placed on the Newington side of the main navigation channel below 18 feet MLLW.

Buoys

Appropriate signs may be placed on the GSB girders and LBB concrete spans to warn of a 5-foot depth where tidal generation equipment is placed. However, the MSO requires that small buoys be placed above and below the bridges to mark the more shallow waters where the equipment is to be placed. The MSO suggests that these buoys can be supplied by either the State of NH (Division of Ports and Harbors, PDA) or that private buoys be placed (the UNH Center for Ocean Engineering or the New England Marine Renewable Energy Consortium). Removal of these buoys during ice season was not discussed, however the MSO is likely aware of that the NH Division of Ports and Harbors removes the small buoys from the estuary during winter.

Contacts:

USCG personnel directly contacted at the Northern New England Sector Office, MSO:
Lt. Jarrett Bleacher
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Master Chief Randy Bucklin
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Main Office contact:
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(207) 767-0320
After working hours contact:
Operations Center at
(207) 767-0303

Section V: University of NH Tidal Energy Research Activities

A. US Department of Energy Grant Application

In December 2007, the United States Congress and President Bush passed the “Energy Independence and Security Act of 2007”. Subtitle C, Sections 633 and 634 of this act instructed the Secretary of the US Department of Energy (US DOE) to solicit applications for grants from business and academic consortia to advance technologies related to hydrokinetic electrical power generation. In May 2008, the US DOE announced the availability of up to \$7.5 Million in grants for advanced technology research to harness energy potential of oceans, tides and rivers; see: <http://www.energy.gov/news/6206.htm>

In June 2008, the University of New Hampshire, in cooperation with several other academic institutions and businesses submitted proposals for two of these US DOE grants. As reflected in the minutes from August 8, 2008 Commission meeting, Co-chair Baldwin stated that UNH is involved with two grant proposals currently pending with the Department of Energy. The first proposal involves the creation of the New England Renewable Energy Consortium, a body comprised of academic institutions from New Hampshire, Massachusetts, Rhode Island and Connecticut. The Consortium requested \$1.4 million over a five year period. UNH’s role in the Consortium would be to study and compare existing marine and hydrokinetic renewable energy technologies beneath the Little Bay and General Sullivan Bridges and offshore. Co-chair Baldwin stated that UNH’s second grant proposal with the Department of Energy is a 2-year collaborative effort with Lucid Technologies and Alden Laboratories to suspend a “Gorlov” Turbine from a small barge that would be attached or anchored to the General Sullivan Bridge. A majority of the members of the Commission present at the May 16, 2008 meeting voted to endorse the University’s grant application.

In September 2008, the US DOE announced the proposals selected for funding under this program; see: <http://www.energy.gov/news/6554.htm> Unfortunately, the New England Renewable Energy Consortium, that included researchers from UNH, did not receive the two Department of Energy grants. Nevertheless, Commission recognizes the opportunities for hydrokinetic technology testing and development at the location of the Little Bay and General Sullivan Bridges and encourages researchers at the University of New Hampshire to pursue such activities with the support of collaborators represented by the membership of the Commission. This is reflected in the **Conclusions** section of this Final Report of the Commission.

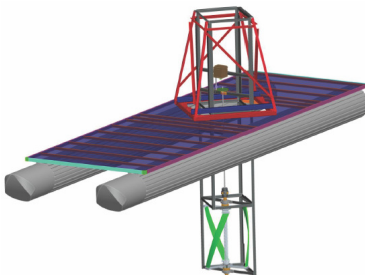
Despite not receiving a US DOE grant in 2008, researchers at UNH, including Commission Co-chair Ken Baldwin, are continuing to seek funding opportunities to advance the study and testing of hydrokinetic technologies at the Little Bay – General Sullivan site. One possible source of funding is the NH Renewable Energy Fund. This fund, created by the state’s renewable portfolio standards (RSA 362-F), is intended to encourage the development of non-fossil fuel based electricity generating capacity in

New Hampshire. A similar program in Rhode Island's program has funded two hydrokinetic feasibility studies; see: <http://www.energy.ri.gov/programs/renewable.php>. The New Hampshire Public Utilities Commission has the authority (under PUC Rules 2507.03 – Renewable Energy Incentives; to fund grant applications that it finds will: *“advance the purposes of RSA 362-F, within the constraint of available funds.”* A copy of the relevant portion of the NH Public Utilities Commission Administrative Rules for the Renewable Energy fund has been reproduced in **Appendix 6**.

The Commission recommends that consideration be given to legislation that would allocate a portion of NH's Renewable Energy Fund (REF) for hydrokinetic research. The NH General Court has established precedent by passing HB 1628 of 2008 that authorized the allocation of up to 10% of NH's REF to provide rebates for installing small-scale renewable generation. A similar allocation might be made to fund hydrokinetic feasibility studies in New Hampshire. These funds may be designated to meet non-federal match requirements for complimentary federal grant programs.

University of New Hampshire Ocean Engineering researchers recently established the Center for Ocean Renewable Energy (CORE). CORE was established to become a place where ocean renewable technology is developed, evaluated and tested, and to provide the training for those interested in pursuing this field. Funding from the NH Renewal Energy Fund, and/or other sources, could be used to support CORE's research and educational activities. It is anticipated that research undertaken at the Little Bay – General Sullivan test site would continue in the same direction as outlined in the May 2008 New England Renewable Energy Consortium's proposal to the US DOE. This proposal included the following description:

The General Sullivan testing facility is located in a constricted area where the Lower Piscataqua enters Little Bay. The proposed working areas consist of a short-term temporary floating platform



and a long-term permanent floating platform. The short-term floating platform will be secured between existing piers #3 and #4 of the General Sullivan Bridge on the Newington Side of the river. The deep area between these two piers contains approximately 25 percent of the cross-sectional area thus creating a unique testing site with consistent relatively high velocity and little slack time when almost 1.3 billion ft³ of water flows under the bridge each tidal cycle.

The short-term temporary platform will be utilized until the completion of the new southbound lane bridge and the rehabilitation of the present bridge into the northbound bridge. Upon completion of the bridge substructure upgrades, estimated to be 2012, the platform will be moved north to the new bridge piers.

Anticipated goals of CORE's efforts at the Little Bay and General Sullivan Bridges site:

1. Establish a research, development and demonstration infrastructure, particularly full and partial-scale ocean test sites, to support the growth of the marine renewable energy industry in the region.
2. Facilitate the development of hydro-kinetic electrical generation technologies by consortium members and other partners.
3. Develop a regulatory and environmental permitting protocol for demonstration and deployment of marine renewable energy systems.
4. Work in concert with the New England Marine Renewable Energy Consortium to meet the needs of stakeholders.

Included below (in **Section B**) is a summary of the June 2008 meeting between NHDOT and Commission Co-chair Baldwin regarding UNH's efforts to install a non-commercial, tidal energy pilot facility beneath the General Sullivan/Little Bay bridges. A formal agreement would be necessary, between hydrokinetic researchers and the NHDOT, to allow the anchoring or attachment of test devices to the Little Bay and General Sullivan Bridges.

B. Meeting Report NHDOT & UNH, June 6, 2008

June 6, 2008

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DESIGN**

MEETING REPORT

PROJECT: NEWINGTON-DOVER
NHS-027-1(27), 11238

DATE OF MEETING: June 4, 2008

LOCATION OF MEETING: Bridge Design Conference Room

ATTENDED BY:	Department of Transportation	University of New Hampshire
	C. Waszczuk	Professor David Gress
	M. Richardson	Professor Kenneth Baldwin
	D. Powelson	
	C. Dusseault	

SUBJECT: Tidal Energy Proposal

NOTES ON MEETING:

Professor Baldwin, Co-Chair of the Tidal Energy Commission, noted that UNH was in the process of drafting two proposals to the Department of Energy to conduct research on tidal energy. UNH feels the University, which is in proximity to Little Bay, is uniquely positioned to utilize the General Sullivan Bridge (GSB) area to study the feasibility of tidal energy. The first proposal, in collaboration with Lucid Technologies, proposes a short-term (20 years) installation, where a "Gorlev" Turbine would be suspended from a small barge which would be attached/anchored to the GSB. A second proposal, in collaboration with several New England Universities that make up the New England Marine Renewable Energy Consortium, proposes a long-term (5+ years) installation with an anchorage system that ideally would be designed into the Little Bay Bridge (LBB) project.

Several attachment options were discussed. C. Dusseault questioned whether an electromagnetic field would be created from the generation of electricity and whether this would increase the potential for corrosion of reinforcing steel in the concrete substructure. Professor Gress noted that UNH would investigate. However, UNH did not envision cabling to shore to transfer the electricity to the regional power grid. It was agreed that this matter needed further investigation.

M. Richardson strongly suggested that an independent anchorage system be devised to provide complete separation between the tidal power equipment and the new LBB piers. With an independent anchorage system that could be anchored to the ledge in the channel bottom and installed as part of the bridge contract, economy could be realized and the long-term integrity of the new LBB would not be compromised. Several items could be included in the bridge

construction contract as non-participating items (which could be funded by the Consortium's study). An agreement between UNH and the Department would be required to define the terms regarding responsibility for payment of what would be completed as part of the bridge contract, as well as defining the liability of all parties. It was noted that the LBB construction contract is envisioned to advertise in January 2010. UNH would need to develop the complete design and construction plans of the turbine anchorages, special provisions, and estimate for the work envisioned in collaboration with the Department, and would need to secure all the necessary permits (ACOE, USCG, etc) associated with construction, operation, and maintenance of the anchorages and tidal turbine systems being tested.

Next Steps:

- UNH will draft a paragraph (summarizing the Department's support for the research efforts) and will forward to M. Richardson & C. Waszczuk for review. The deadline for the proposals is June 12th.
- UNH expects to receive a decision on whether their proposal(s) are accepted and funded in late July / early August of 2008
- Upon request, Bridge Design will provide existing bridge plans to UNH to facilitate their design of the anchorage system. The anchorage system plans & design would be required for review by the Department in the spring of 2009 with final plans due in the fall of 2009 for inclusion into the bridge construction contract.
- An agreement would need to be developed with UNH working with Bridge Design to draft the agreement language.

Submitted by:

Christopher M. Waszczuk, P.E.
Chief Project Manager

Noted By: MWR

cc: B. Cass
M. Richardson (via e-mail)
K. Baldwin, UNH (via e-mail)
D. Gress, UNH (via e-mail)

Section VI: Conclusions of the NH Tidal Energy Commission

Whereas: The tidal currents passing under the Little Bay and General Sullivan bridges represent a remarkable source of renewable energy that could be harnessed for the benefit of the citizens of New Hampshire; and

Whereas: The location beneath the Little Bay and General Sullivan Bridges is ideal because of the natural tidal restriction that exists there and because of the close proximity to the existing electrical grid and other infrastructure;

Therefore, the NH Tidal Energy Commission concludes:

1. Based on preliminary tidal flow data and environmental limitations to restricting that flow, and the need to maintain existing boating/shipping channels, it remains a question whether a commercially viable power generation facility can be build beneath the Little Bay- General Sullivan bridges.
2. The hydrokinetic power generation industry in the US has not yet overcome technological challenges that limit large-scale development of generating facilities. The Commission feels that the tidal currents passing under the Little Bay- General Sullivan bridges provide a unique test environment to assess new technologies to harness power in a constricted flow configuration.
3. The Commission recognizes the opportunities for hydrokinetic technology testing and development at this location and encourages researchers at the University of New Hampshire to pursue such activities with the support of collaborators represented by the membership of the Commission.

Section VII: Recommendations for Future Legislation

1. The Commission recommends legislation that would better define the authority of the state to least lands submerged under the waters of the state. Legislative Service Request (LSR) 2009-H-0689-R has been filed by Representative James Garrity, of Atkinson, to fulfill this recommendation.

The following outline has been provided to the NH Office of Legislative Services for the potential structure of a submerged lands leasing bill. Legislative Services has also been advised that Maine has a statute addressing this issue. See:

<http://www.mainelegislature.org/legis/Statutes/12/title12sec1862.html>

Why –

- 1) Clarifies the public ownership and jurisdiction over tidally submerged lands.
- 2) Assesses a leasing fee for commercial activities.
- 3) Allows for time-limited exclusive use of submerged lands.
- 4) Creates a source of funding for coastal management activities.

What –

Leases for commercial, non-riparian activities that utilize lands below the mean high tide. This would maintain the current fee and leasing activities for moorings and aquaculture activities. This does not apply to commercial fishery support activities, permitted land-owner activities (such as docks and marinas) and public infrastructure projects. This would primarily relate to pipelines, cables, energy facilities, etc. This does not impact the permitting process or any other environmental or navigation review.

How much –

To be determined by the legislature. Maine charges \$200 for an application and a maximum of \$1200 per year (except for “large projects”).

Who would administer –

To be administered by DES through the Coastal Program. The funds would be used for 50% for activities related to permitting, working with the public and coordinating off-shore activities. The remaining 50% will be granted out for activities such as public access, protecting working waterfronts and sediment management.

Questions to answer –

Could non-commercial activities be leased, such as shellfish restoration or other conservation activities? Should aquaculture and mooring related activities be integrated into this? Is DES the right agency? What is the maximum duration of the lease (some states have 30 years)?

2. The Commission recommends consideration be given to legislation that would allocate a portion of NH's Renewable Energy Fund (REF), generated by the state's renewable portfolio standards (RSA 362-F), for hydrokinetic research. These funds may be designated to meet non-federal match requirements for complimentary federal grant programs. This program might follow the example of Rhode Island's program that has funded two hydrokinetic feasibility studies.
See: <http://www.energy.ri.gov/programs/renewable.php>

The NH General Court has established precedent by passing HB 1628 of 2008 that authorized the allocation of up to 10% of NH's REF to provide rebates for installing small-scale renewable generation. A similar allocation might be made to fund hydrokinetic feasibility studies in New Hampshire. The New Hampshire Public Utilities Commission also has the authority (under PUC Rules 2507.03 – Renewable Energy Incentives; to fund grant applications that it finds will: *“advance the purposes of RSA 362-F, within the constraint of available funds.”* A copy of the relevant portion of the NH Public Utilities Commission Administrative Rules for the Renewable Energy fund has been reproduced in **Appendix 6**.

3. Finally, The Commission recognizes that there is a need for an ongoing Tidal Energy Commission or Advisory Council. It was suggested that the New Hampshire Coastal Program could convene annual meetings summarizing the status of offshore/tidal renewable energy issues. This recommendation does not require legislation, but the Commission requests that the NH Coastal program keep the members informed of hydrokinetic energy development activities in the vicinity of the Little Bay and General Sullivan Bridges.

Appendix 1:
NH Tidal Energy Commission
Commission Membership
(November 1, 2008)

A. House of Representatives

Marcia Moody

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marciagm@surfglobal.net

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Roland Hofemann

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B. Senate

Jacalyn Cilley

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Martha Fuller Clark

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C. Department of Transportation

Christopher Waszczuk

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D. Office of Energy & Planning

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Eric Steltzer

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E. Public Utilities Commission

Michael Harrington

Public Utilities Commission, 21 South Fruit Street, Suite 10, Concord, 03301;

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F. National Marine Fisheries Service

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Mike Johnson

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G. City of Dover

Representative Thomas Fargo (Commission Co-Chair)

14 Cobble Hill Drive, Dover, 03820; phone: 743-4290

thomasfargo@comcast.net

H. Town of Newington

Jack Pare

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I. NH Estuaries Project

Cynthia Copeland, Executive Director

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Brian Giles

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J. Department of Environmental Services

Ted Diers, Program Manager (Commission Vice Chair)

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K. Fish & Game Department

Peter Wellenberger, GBNERR

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L. Pease Development Authority, Division of Ports & Harbors

Tracy Shattuck, Harbor Master

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M. NH Commercial Fishermen's Association

Erik Anderson, President

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N. Public Appointee

Nancy Borden

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O. Representatives of Environmental Protection or Advocacy Organizations

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Joel Harrington, Government Relations Director

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P. University of New Hampshire

Ken Baldwin, Director – Center for Ocean Engineering (Commission Co-Chair)

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Q. Office of Consumer Advocate

Otis Perry, Vice Chair

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R. Other Interested Parties and Voluntary Participants

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Dave Kellam
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Craig Yankes
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Appendix 2: NH Tidal Energy Commission Compilation of Meeting Minutes

NH Tidal Energy Commission Meeting

NHDES Pease Field Office, Portsmouth, NH
August 29, 2007, 9:30 AM

Members: Rep. Marcia Moody, Newmarket (Meeting Chair)
Rep. Roland Hofemann, Dover
Michael Dugas, Department of Transportation
Jack Ruderman, Office of Energy and Planning
Sean Mc Dermott, National Marine Fisheries Service
Rep. Thomas Fargo, City of Dover
Jack Pare, Town of Newington
Dr. Ken Baldwin, UNH
Cynthia Copeland, (SRPC) for NH Estuaries Project
Erik Anderson, NH Commercial Fishermen's Assoc.
Ted Diers, NHDES Coastal Program
Nancy Borden, Member of Public
Otis Perry, Office of Consumer Advocate
Eric Steltzer, Rockingham Planning Commission

Other Attendees: David Funk, Great Bay Stewards
Peter Briss, City of Portsmouth
Kathleen Lewis, PSNH
David Lellem, NH Estuaries Project
Christian Williams, NH Coastal Program

Summary:

Rep. Marcia Moody, acting Chair, asked the attendees to introduce themselves.

Jack Pare, Commission member from Newington, gave an overview of tidal energy technology for members. Mr. Pare presented the following salient points about tidal energy beneath the GS-LB bridges:

- Predictable, unending energy source.
- Area of Estuary System Upstream of Bridges: 8.9 square miles of water (5,696 acres)
- Volume (Tidal Prism) Passing Under Bridges per Tide Cycle: 1.29 Billion Cubic Feet

- Maximum Current Velocity, Combined Pier (NHDOT Draft EIS Model Case 5):
 - 9.2 ft/sec (2.8 m/sec) flood
 - 9.8 ft/sec (3.0 m/sec) ebb
- Water volume must pass through 23,000 square feet (approx 1/2 acre).
- Two-knot 'stall point' is less than 25 minutes.
- Zero velocity seldom exceeds 10 minutes.
- Can yield a capacity factor of around 60%.
- Power transmission infrastructure close to bridges.
- Can balance tidal generation with nearby peaking plant generation.
- Bridge location is totally within NH jurisdiction.
- Bridge substructure to be modified in near future to widen bridges resulting in 200-ft long channels.
- No large vessels pass under bridges.
- "Tidal fence" generating scheme less disruptive than dispersed array of "underwater wind farm".
- Variety of equipment available for application. Preference seems to go toward ducted, slow-moving blade technologies.
- Ecological considerations:
 - Impacts on fin and lobster fisheries?
 - Impacts on marine mammals?
 - Impacts on the ebb and flow of tides throughout the Great Bay Estuary?

Member Discussions:

- Ken Baldwin stated that currents in the study area are not as simple as many assume.
- Sean McDermott stated that Verdent's (NH Tidal Energy Company) data is not solid in their projects in the Merrimack and East Rivers.
- Erik Anderson stated that the biological assessment portion of the project is very important
- Jack Pare identified several FERC permit issues of potential concern.

The Commission members discussed whether subsequent meetings should be held in Concord or in the seacoast area. Most members indicated that a seacoast location would be preferred. The next commission meeting was scheduled for Thursday, September 20, 2007 at 9:30 AM at the NHDES Pease Field office.

The meeting was adjourned to take a walking tour of the Little Bay - General Sullivan bridges site. Most members also eat lunch at the nearby Newick's Restaurant.

NH Tidal Energy Commission Meeting

NH Department of Environmental Services

Pease Field Office, Portsmouth, NH

September 20, 2007, 9:30 AM

Members: Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Rep. Roland Hofemann, Dover
Rep. Marcia Moody, Newmarket
Erik Anderson, NH Commercial Fishermen's Assoc.
Cynthia Copeland, NHEP (Strafford Regional Planning Commission)
Michael Dugas, Department of Transportation
Michael Harrington, Public Utilities Commission
Jack Pare, Town of Newington
Otis Perry, Office of Consumer Advocate
Jack Ruderman, Office of Energy and Planning
Eric Steltzer, Rockingham Planning Commission
Peter Wellenberger, Great Bay National Estuarine Research Reserve

Other Attendees: Craig Yankes, NH Sustainable Energy Assoc.
Christian Williams, NH Coastal Program

Guest Speaker: Carl Kammerer, of the National Oceanic and Atmospheric Administration's National Ocean Service Center for Operational Oceanographic Products and Services

Summary:

Co-chair, Rep. Tom Fargo, asked the attendees to introduce themselves and check contact information sheet (passed around) for correctness.

Dr. Carl Kammerer gave a presentation summarizing findings of a 2007 tidal current survey of the Piscataqua River. The survey collected tidal current data using an acoustic Doppler current profiler at 11 locations along the Piscataqua River. Dr. Kammerer presented preliminary data from three of the eleven locations, Henderson Point, the I-95 bridge, and Schiller Station, which showed that maximum currents in these locations varied from approximately 3 -5 knots.

Rep. Fargo then informed attendees that information about the commission, including the text of House Bill 694, Commission member contact information, meeting information, and relevant tidal energy information, is now available on the DES-New Hampshire Coastal Program (NHCP) web site at:

http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm.

He stressed the importance of sharing information and encouraged members to submit relevant tidal energy information to him at thomasfargo@comcast.net or to Chris Williams of the NHCP at cwilliams@des.state.nh.us for posting on the Commission's web page. The NHCP will make every effort to post the information as quickly as possible.

Rep. Fargo then stated that the Commission would be able to accomplish its duties within the timeframes established by HB 694 most effectively if it created subcommittees. He recommended establishing four subcommittees each focusing on one of the following subject areas: 1) Permitting Requirements; 2) Public & Business Community Outreach; 3) Environmental & Wildlife Impact Analysis; and 4) Cost & Benefits Analysis. Each subcommittee would elect a chair and establish its own procedures and protocols. The subcommittees would meet more frequently than the Commission and would report their findings at Commission meetings. Rep. Fargo provided a sign-up sheet for each subcommittee and encouraged members to participate in one or more subcommittees.

A roundtable discussion followed. The discussion focused on the content of the Commission's initial report of its findings and recommendations due by November 1, 2007. It was agreed that the initial report would establish a framework for addressing the issues/questions raised by each of the subcommittees. The discussion then turned to the issue of ownership and jurisdiction of river beds. It was agreed that the Commission should seek an opinion from the Attorney General's Office on this issue.

The next commission meeting was scheduled for **Friday, November 2, 2007 at 1:00 PM at the NH Fish & Game Department (NHF&G) Office in Durham**. Directions to the NHF&G Office will be provided on the commission's web page.

Meeting adjourned at 11:15 AM

NH Tidal Energy Commission Meeting Minutes

NH Fish & Game Department Region 3 Office, Durham, NH
November 2, 2007, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Ted, Diers, Vice-Chair, NH Coastal Program
Rep. Marcia Moody, Newmarket
Nancy Borden, Public Appointee
Cynthia Copeland, NHEP (Strafford Regional Planning Commission)
Brian Giles, NH Estuaries Project
Joel Harrington, The Nature Conservancy
Michael Harrington, Public Utilities Commission
Jack Pare, Town of Newington
Tracy Shattuck, PDA - Division of Ports and Harbors
Eric Steltzer, Rockingham Planning Commission
Christopher Waszczuk, NH Department of Transportation
Peter Wellenberger, Great Bay National Estuarine Research Reserve

Other Attendees:

David Funk, Great Bay Stewards
David Kellam, NH Estuaries Project
Kathleen Lewis, Public Service of New Hampshire
Craig Yankes, New Hampshire Sustainable Energy Association

Summary:

The interim report draft is complete and was presented. The commission members discussed the four subcommittees and their respective issues. The list of issues and questions was updated based on this discussion. There were a few changes recommended to the draft report: 1) change the name of the Cost Benefit Analysis Subcommittee to Technical Feasibility and Costs Subcommittee; 2) change the name of the Wildlife and Environmental Impact Subcommittee to Wildlife and Environmental Assessment Subcommittee; and 3) list subcommittee members in the report. The commission voted to approve the report with these changes.

Co-chair, Rep. Fargo reported that he had spoken with the Attorney General's office regarding state ownership and control of the bridge and underwater lands. He asked them to attend the commission's next meeting for a discussion of these and other issues related to the work of the commission.

The commission then discussed the FERC process relative to the timing of the pre-permitting license. The commission discussed requesting an early determination from FERC relative to the feasibility of the applicants' claim to the area.

Co-chair Fargo will invite the two applicants with pre-permitting licenses to an upcoming meeting, perhaps in January to give updates to the commission.

Anyone with comments for the various subcommittees should send them to the subcommittee chairs who will report at the next meeting. The Coastal Program will compile comments and suggestions for the Permit Compliance Subcommittee.

The next meeting will take place on December 7, 2007 with meeting location to be announced.

The meeting was adjourned at 3:30 PM.

NH Tidal Energy Commission Meeting Minutes

NH Fish & Game Department Region 3 Office, Durham, NH
December 7, 2007, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Ted, Diers, Vice-Chair, NH Coastal Program
Rep. Roland Hofemann, Dover
Cynthia Copeland, NHEP (Strafford Regional Planning Commission)
Brian Giles, NH Estuaries Project
Joel Harrington, The Nature Conservancy
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Jack Ruderman, Office of Energy and Planning
Tracy Shattuck, PDA - Division of Ports and Harbors
Bruce Smith, NH Fish & Game Department
Eric Steltzer, Rockingham Planning Commission
Christopher Waszczuk, NH Department of Transportation
Peter Wellenberger, Great Bay National Estuarine Research Reserve

Other Attendees:

David Funk, Great Bay Stewards
David Kellam, NH Estuaries Project
Christian Williams, NH Coastal Program

Guest Speaker:

Evan Mulholland, NH Department of Justice

Summary:

Co-chair, Rep. Tom Fargo asked members if they had any comments on the commission's Initial Report ("Report"), dated November 2007, which was recently emailed to all commission members. He reminded members that the Report was a requirement of the commission's enabling legislation. There were no comments from commission members. The Report can be found at the commission's web page at http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm and on the New Hampshire General Court Statutory and Study Committee search page located at <http://www.gencourt.state.nh.us/statstudcomm>.

Rep. Fargo then asked Dave Kellam to explain the "wiki" page that he created for the commission's Environmental and Wildlife Impact Assessment (EWIA) Subcommittee. Dave explained that a wiki page is a free, editable web page that allows interested parties to participate in chat room-like discussions. The EWIA Subcommittee wiki page, which

can be found at <http://tidal-subcom.wikispaces.com>, is currently set-up to be viewed and edited by any interested party. All edits are tracked and recorded. Dave explained that wiki pages can also be set-up with restrictions on who can view and/or edit the content. Dave offered his assistance in developing wiki pages for any of the other commission subcommittees that may be interested.

Rep. Fargo then introduced Evan Mulholland of the NH Department of Justice, Attorney General's Office, Environmental Protection Bureau to discuss submerged lands issues. Mr. Mulholland focused his discussion on the following three subject areas: 1) Lease or transfer of submerged land; 2) Fees and taxes; 3) Regulation. A summary of the issues discussed and questions raised is provided below:

1. Lease or Transfer of Submerged Land

- State owns the land subject to the public trust, with reasonable restrictions.
- State can transfer ownership if it chooses to, subject to legislative action and can lease rights to install structures on the bed of submerged lands.
- Aquaculture model in NH utilizes a permit system not a lease.
- Ownership in fee versus ownership via public trust.
- Right-of-way for DOT stops at the highest observable tide line (HOTL), what about right-of-way for Public Utilities Commission (PUC)?
- Does PUC have a leasing program?
- Council on Resources and Development (CORD) oversees sales of state land.
- Is leasing of state land subject to same process?
- Is DOT issued leases through CORD?
- FERC gives power to condemn land on hydropower projects.
- Could an applicant get FERC to allow for condemnation of lands above the HOTL?
- Navigable servitude allows for dredging on public lands for navigation.

2. Fees and Taxes

- DES Dam Bureau has a filing fee for new dams and annual fee for maintenance based on hazard class.
- Per RSA 72:8, electric plants and pipe lines taxed as real estate in the town in which the plant/pipe line is located.
- Per RSA 83-F, Utility Property Tax, tax imposed on value of utility property at rate of \$6.60 per \$1,000 of assessed value.
- Can a municipality tax something under water?
- Towns can have tax exemption for renewable energy?
- How would taxes change if state owned the facility?

3. Regulation

- Federal versus state regulations.
- Federal Energy Regulatory Commission (FERC) is federal agency that licenses hydropower projects.
- FERC jurisdiction comes from Federal Power Act, which preempts state laws.
- Appears that all regulations other than those of the Clean Water Act (CWA) are preempted by FERC.
- FERC must, however, consult with state.
- Disputes regarding fisheries, access and other issues often resolved through settlement agreements.
- CWA Section 401 Water Quality Certification and Coastal Zone Management Act Consistency Certification are incorporated into FERC license.
- FERC permits don't preempt water rights.
- City of Portsmouth may have rights to Piscataqua River based on Little Pond case from 1879.

Mr. Mulholland offered to provide further assistance to the commission regarding submerged lands and other legal issues. He hopes to prepare a briefing document for the commission in the next couple of months. Commission members can email questions/comments directly to him at: evan.mulholland@doj.nh.gov. He agreed to look further into the following specific issues:

1. Does the state have to negotiate exclusively with NH Tidal Energy Company because FERC has granted it a preliminary permit for the area under the General Sullivan and Little Bay Bridges, or could the state negotiate with another vendor?
2. Who would be the primary contact for companies proposing a lease?
3. What is FERC's competing application process?
4. What is the nature of the taxes for Seabrook Station?
5. Is there a need for the state to enact legislation to preserve work areas near bridges?

Rep. Fargo then asked for updates from each of the commission's subcommittees. Cynthia Copeland reviewed a draft work plan that she and Kathleen Lewis of PSNH developed for the Public and Business Community Outreach Subcommittee. Chris Williams of the Permitting Requirements Subcommittee stated that the subcommittee had not yet met, but would likely do so in early January. The Environmental and Wildlife Impact Assessment Subcommittee referenced the development of its wiki page. Commission Co-chair, Ken Baldwin, stated that the Technical Feasibility, Cost and Benefits Analysis Subcommittee, which he chairs, had not yet met. He stated that perhaps the most critical issue facing the subcommittee involves determining how much energy can be harnessed from the tides in the Piscataqua River.

Rep. Fargo stated that he'd like the actions of the subcommittees to be as transparent as possible and suggested placing subcommittee notes on the commission's web page and/or on wiki pages.

Interest was expressed in having the two companies that have received preliminary permits from FERC, UEK Corporation and NH Tidal Energy Company, speak at the next commission meeting. Rep. Fargo stated that he'd contact them.

The next commission meeting was scheduled for **Friday, January 18, 2008 at 1:00 PM at the NH Department of Environmental Services (DES) Pease Office in Portsmouth.** Directions to the NHDES Pease Office will be provided on the commission's web page.

Meeting was adjourned at 2:55 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services

Pease Field Office, Portsmouth, NH

January 18, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Ted, Diers, Vice-Chair, NH Coastal Program
Rep. Roland Hofemann, Dover
Erik Anderson, NH Commercial Fishermen's Association
Cynthia Copeland, NHEP (Strafford Regional Planning Commission)
Sean McDermott, National Marine Fisheries Service
Otis Perry, Consumer Advocate Advisory Board
Tracy Shattuck, PDA - Division of Ports and Harbors
Eric Steltzer, Rockingham Planning Commission
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

David Funk, Great Bay Stewards
Jim Irish, UNH
David Kellam, NH Estuaries Project
Christian Williams, NH Coastal Program
Craig Yankes, NH Sustainable Energy Association

Guest Speakers:

Rob Cinq-Mars, Free Flow Energy
Michael Hoover and Daniel Power, Oceana Energy Company

Summary:

Co-chair, Rep. Tom Fargo asked commission members for comments on the draft versions of the November 2, 2007 and December 7, 2007 meeting minutes. No comments were received. Co-chair Fargo then made a motion to approve the minutes. The minutes were unanimously approved by members. Final versions of the minutes will be posted on the commission's web page at:

http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm.

Co-chair Fargo then introduced Daniel Power, President and Chief Technology Officer, and Michael Hoover, Secretary, Treasurer and General Counsel, for Oceana Energy Company (OEC). Mr. Hoover gave a presentation summarizing OEC's proposal to install tidal in-stream energy conversion devices in the Piscataqua River. He briefly reviewed the nature of OEC's preliminary permit, issued by the Federal Energy Regulatory Commission in April 2007, and OEC's next steps under the preliminary

permit, including assessing the river's currents, identifying potential conflicts with existing river uses, ensuring technology compatibility, and performing economic analyses. He also discussed OEC's tidal in-stream energy conversion technology. Following the presentation, Mr. Hoover fielded questions from commission members.

Co-chair Fargo then introduced Rob Cinq-Mars of Free Flow Energy. Mr. Cinq-Mars gave a presentation entitled "Power & Energy Potential of the Piscataqua River." The presentation focused on a preliminary, rudimentary analysis of the data from Carl Kammerer's 2007 tidal current survey of 11 locations in the Piscataqua River. The objective of this analysis was to estimate the energy generating capacity at each location. Mr. Cinq-Mars analysis indicated that only 2-3 of the locations surveyed had strong enough currents for practicable energy generation. Discussion followed.

Erik Anderson, Commission representative from NH Commercial Fishermen's Association, asked if anyone present could explain what use limitations might be associated with security zones or property rights surrounding generation facilities deployed in the estuary. It was suggested that some combination of aids to navigation and fishing restrictions should be expected.

Dr. Jim Irish, of UNH, provided some insights reflecting his knowledge of tidal currents in the Piscataqua River and Great Bay Estuary. Dr. Irish suggested that flow out of the estuary, due to river discharges, creates significantly more generation potential on the ebb tide. Dr. Irish stated that more than 90% of the energy associated with the tides is located within the main river channel, making it difficult to maximize energy recovery while maintaining navigation. In areas outside of the main channel, eddies and turbulence create short-term variations in flow direction and velocity that inhibit efficient energy recovery.

Co-chair Fargo then provided members with a brief overview of the Energy Independence and Security Act of 2007 (H.R. 6). Title VI, Subtitle C (Marine and Hydrokinetic Renewable Energy Technologies) of the Act directs the Department of Energy (DOE) to create a research & development program focused on technology that produces electricity from waves, tides, currents, and ocean thermal differences. The Act also directs DOE to award grants to institutions of higher education to establish National Marine Renewable Energy Research, Development, and Demonstration Centers. Co-chair, Ken Baldwin, stated that UNH is in the process of establishing a Center for Ocean Energy, which will be well positioned to apply for funding under this legislation.

Co-chair Fargo then asked for updates from each of the commission's subcommittees. Chris Williams, chair of the Permitting Requirements Subcommittee, stated that the subcommittee met on January 9, 2008 to review and update the list of applicable laws and regulations identified in Appendix B of the commission's Initial Report, November 2007. He stated that the subcommittee had developed a draft revised list for review by commission members. Copies of the draft list were made available to commission members. The draft list will also be posted on the commission's web page at

http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm. There were no other subcommittee updates.

Co-chair Fargo stated that one topic of discussion at the next commission meeting will be whether the commission should expand the geographic scope of its review to areas beyond the Little Bay and General Sullivan Bridges.

The next commission meeting was scheduled for **Friday, February 15, 2008 at 1:00 PM at the NH Department of Environmental Services (DES) Pease Office in Portsmouth**. Directions to the NHDES Pease Office will be provided on the commission's web page.

Meeting was adjourned at 3:15 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services
Pease Field Office, Portsmouth, NH
February 15, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Nancy Borden, Public Appointee
Cynthia Copeland, NHEP (Strafford Regional Planning Commission)
Brian Giles, NH Estuaries Project
Kathleen Lewis, Public Service of New Hampshire
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Jack Ruderman, NH Office of Energy and Planning
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

Aiman Alawa, Free Flow Energy
Rob Cinq-Mars, Free Flow Energy
Jay Clement, U.S. Army Corps of Engineers
Henry Dormitzer, Free Flow Power
Dan Edson, Free Flow Energy
Pete Feeney, Free Flow Energy
David Funk, Great Bay Stewards
Jim Irish, UNH
David Kellam, NH Estuaries Project
Norwand Laberge, Free Flow Energy
Gail Pare, Great Bay Coast Watch
Justin Richardson, Upton Hatfield, LLP
Christian Williams, NH Coastal Program
Craig Yankes, NH Sustainable Energy Association

Guest Speaker:

Denise Vauthier, UEK Corporation

Summary:

Co-chair, Rep. Tom Fargo asked attendees to introduce themselves.

Co-chair Fargo then asked commission members for comments on the draft version of the January 18, 2008 meeting minutes. No comments were received. Co-chair Fargo then

made a motion to approve the minutes. The minutes were unanimously approved by members. The final version of the minutes will be posted on the commission's web page at: http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm. Co-chair Fargo then introduced Denise Vauthier, Senior Vice President of Underwater Electric Kite (UEK) Corporation. Ms. Vauthier gave a presentation summarizing UEK's tidal hydrokinetic power proposal for the Piscataqua River. She briefly reviewed UEK's patented bi-directional hydroturbine assembly technology. She also discussed the goals and phasing of UEK's Piscataqua River proposal, as well as the environmental and installation-related issues facing the proposal. Following the presentation, Ms. Vauthier fielded questions from commission members. Ms. Vauthier's presentation will be posted on the commission's web page.

Co-chair Fargo then referred members to the memorandum from Evan Mulholland of the NH Department of Justice, Attorney General's Office dated February 14, 2008. The memorandum addressed a number of questions raised by commission members at the December 7, 2007 meeting. Co-Chair Fargo requested that members review the memorandum and direct any additional questions to him via email. He stated that he'd compile the additional questions and submit them to Mr. Mulholland. Co-Chair Fargo stated that he intends to incorporate the memorandum and any additional correspondence from Mr. Mulholland into the commission's final report to the legislature.

Co-Chair Fargo then asked for updates from each of the commission's subcommittees. Chris Williams, chair of the Permitting Requirements Subcommittee, stated that he had not received any comments from commission members regarding the draft revised list of applicable laws and regulations that was presented at the last meeting. He stated that he is seeking comments on the draft list, which is available on the commission's web page. Kathleen Lewis, chair of the Public and Business Community Outreach Subcommittee, stated that the subcommittee has been compiling information presented by the Guest Speakers at prior meetings and is awaiting the findings of the other subcommittees. Co-Chair Fargo then informed members that Peter Wellenberger is unable to continue to serve as chair of the Environmental and Wildlife Impact Assessment Subcommittee. He asked for a volunteer to chair the subcommittee. Sean McDermott agreed to serve as chair of the subcommittee. Ken Baldwin, chair of the Technical Feasibility, Cost and Benefits Analysis Subcommittee, stated that the subcommittee met once, but not the full subcommittee. He stated that the subcommittee plans to meet before the next Commission meeting.

Co-chair Fargo then opened the meeting up for a roundtable discussion of items of interest to commission and non-commission members. Jack Pare presented a motion to endorse the UNH student test project to deploy a turbine under the General Sullivan Bridge. The motion was approved by the Commission.

The next commission meeting was scheduled for **Friday, March 28, 2008 at 1:00 PM at the NH Department of Environmental Services Pease Office in Portsmouth.**

Directions to the NHDES Pease Office will be provided on the commission's web page. Meeting was adjourned at 4:00 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services

Pease Field Office, Portsmouth, NH

April 11, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Rep. Marcia Moody, Newmarket
Nancy Borden, Public Appointee
Joseph Broyles, Office of Energy & Planning
Joel Harrington, The Nature Conservancy
Michael Harrington, Public Utilities Commission
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Otis Perry, Consumer Advocate Advisory Board
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

Mike Johnson, National Marine Fisheries Service
Gail Pare, Great Bay Coast Watch
Christian Williams, NH Coastal Program

Summary:

Co-chair, Rep. Tom Fargo asked attendees to introduce themselves.

Co-chair Fargo then asked commission members for comments on the draft version of the February 15, 2008 meeting minutes. No comments were received. Co-chair Fargo then made a motion to approve the minutes. The minutes were unanimously approved by members. The final version of the minutes will be posted on the commission's web page at: http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm.

Co-chair Fargo then asked Ken Baldwin, Commission Co-chair and Chair of the Commission's Technical Feasibility, Cost & Benefits Analysis Subcommittee to report on the subcommittee's findings. Dr. Baldwin briefly described the physics of harnessing tidal power and the variables needed to calculate the amount of electrical generating capacity that exists under the Little Bay and General Sullivan bridges. He characterized his calculations as preliminary; but on a steady-state basis approximately 1.2 megawatts of power could be expected to be produced by installing hydrokinetic turbines under the bridges. A more detailed subcommittee will be forthcoming.

Co-Chair Fargo then asked for updates from each of the commission's subcommittees.

There was no new information presented by the Permitting Requirements Subcommittee and the Public and Business Community Outreach Subcommittee. Sean McDermott, chair of the Environmental and Wildlife Impact Assessment Subcommittee, stated that his attempts to convene a meeting of the subcommittee prior to today's Commission meeting were unsuccessful. He stated that he would meet with subcommittee members following today's meeting to schedule a meeting or conference call.

Co-chair Fargo then opened the meeting up for a roundtable discussion of items of interest to commission and non-commission members. Chris Waszczuk stated that the NHDOT is awaiting the record of decision by the Federal Highway Administration regarding the Final Environmental Impact Statement for the proposed Spaulding Turnpike Improvements. Proposed improvements include widening and rehabilitation of the Little Bay Bridges and rehabilitation of the General Sullivan Bridge. He stated that subsurface exploration in the channel beneath the General Sullivan Bridge is scheduled to begin this summer. NHDOT anticipates project construction to begin in 2010.

Jack Pare asked about the controlling depth of the channel beneath the General Sullivan Bridge. Specifically, would the U.S. Coast Guard (USCG) allow equipment (e.g., a tidal energy turbine) in the main portion of the channel beneath the bridge? He agreed to contact the USCG regarding this issue.

The next commission meeting was scheduled for **Friday, May 16, 2008 at 1:00 PM at the NH Department of Environmental Services Pease Office in Portsmouth.**

Directions to the NHDES Pease Office will be provided on the commission's web page.

Meeting was adjourned at 3:00 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services
Pease Field Office, Portsmouth, NH
May 16, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Nancy Borden, Public Appointee
Ted Diers, NH Coastal Program
Brian Giles, NH Estuaries Project
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Jack Ruderman, NH Office of Energy & Planning
Tracy Shattuck, PDA Division of Ports & Harbors
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

David Funk, Great Bay Stewards
Mike Johnson, National Marine Fisheries Service
Dave Kellam, NH Estuaries Project
Gail Pare, Great Bay Coast Watch
Justin Richardson, Upton & Hatfield, LLP
Christian Williams, NH Coastal Program

Summary:

Co-chair, Rep. Tom Fargo asked attendees to introduce themselves.

Co-chair Fargo then informed members that the draft minutes from the April 11, 2008 meeting were not ready for review and approval by commission members. He stated that the minutes would be ready for review and approval at the next commission meeting. Co-chair Fargo reminded members that meeting minutes are posted on the commission's web page at:

http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm.

Co-Chair Fargo then asked for updates from each of the commission's subcommittees. Ken Baldwin, Commission Co-chair and Chair of the Commission's Technical Feasibility, Cost & Benefits Analysis Subcommittee stated that the subcommittee had not met since before the last meeting. He also stated that he had not yet compiled the information that he presented to members at the last meeting. Chris Williams, chair of the Permitting Requirements Subcommittee, stated that he had recently updated the subcommittee's draft list of applicable laws and regulations to reflect the Federal Energy Regulatory Commission's (FERC) hydrokinetic energy pilot project licensing process

and its process for issuing conditioned licenses for hydrokinetic energy projects. He stated that the revised draft list of applicable laws and regulations can be found on the commission's web page. There was no one in attendance from the Public and Business Community Outreach Subcommittee to report on the subcommittees efforts. Co-chair Fargo noted that this subcommittee needs the results of the Technical Feasibility, Cost & Benefits Analysis Subcommittee to decide how to proceed with their efforts. Sean McDermott, chair of the Environmental and Wildlife Impact Assessment Subcommittee, stated that the subcommittee had compiled a list of environmental and wildlife resources potentially affected by a hydrokinetic energy project. This list was attached to the email containing the agenda for today's meeting that was recently sent by Co-chair Fargo. He stated that the resources identified in the list would be managed under the laws and regulations identified by the Permitting Requirements Subcommittee. Mr. McDermott asked commission members for comments on the list. Several commission members provided minor comments.

Co-chair Fargo then reminded members that the commission's final report is due on or before November 1, 2008. He stated that the final report should include four chapters representing the work of each of the commission's four subcommittees. He also suggested that the report contain additional chapters focusing on each of the following topics: 1) Legal issues reviewed by the Attorney's General (AG's) Office; 2) FERC preliminary permit holders' activities; 3) Planned/ongoing UNH activities; 4) Commission recommendations for further legislation; and 5) Conclusions. Discussion followed regarding each of these topics. Co-chair Fargo stated that he'd prepare the chapter summarizing the legal issues reviewed by the AG's Office. Jack Pare and Justin Richardson agreed to work on the chapter reviewing FERC preliminary permit holders' activities. Co-chair Baldwin, who discussed UNH's efforts to secure a grant for offshore renewable energy from the Department of Energy, agreed to summarize UNH's planned/ongoing activities regarding hydrokinetic energy. Ted Diers, Commission Vice-Chair, presented a motion that the commission write a letter to the Department of Energy supporting UNH's efforts. The motion was approved by commission members with two abstentions due to potential conflicts of interest. Mr. Diers also agreed to develop some recommendations for further legislation, including submerged lands leasing. Co-chair Fargo then presented/discussed the commission's three primary conclusions:

- 1) Based on preliminary tidal flow data and environmental limitations to restricting that flow, and the need to maintain existing boating/shipping channels, it remains questionable whether a commercially viable power generation facility can be built beneath the Little Bay and General Sullivan bridges.
- 2) The hydrokinetic power generation industry in the U.S. has not yet overcome technological challenges that limit large-scale development of generating facilities. The Commission feels that the tidal currents passing under the Little Bay and General Sullivan bridges provide a unique test environment to assess new technologies to harness power in a constricted flow configuration.
- 3) The Commission recognizes the opportunities for hydrokinetic technology testing and development at this location and encourages researchers at the

University of New Hampshire to pursue such activities with the support of collaborators represented by the membership of the Commission.

Co-chair Fargo then opened the meeting up for a roundtable discussion of items of interest to commission and non-commission members. The discussion focused primarily on the state's ability to lease submerged lands to generate revenue.

The next commission meeting was scheduled for **Friday, June 27, 2008 at 1:00 PM at the NH Department of Environmental Services Pease Office in Portsmouth.** Directions to the NHDES Pease Office will be provided on the commission's web page.

Meeting was adjourned at 3:30 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services
Pease Field Office, Portsmouth, NH
August 8, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Ted Diers, Vice-Chair, NH Coastal Program
Brian Giles, NH Estuaries Project
Christopher Waszczuk, NH Department of Transportation
(A quorum of members was not present)

Other Attendees:

David Funk, Great Bay Stewards
Christian Williams, NH Coastal Program

Summary:

Co-chair Fargo stated that he had intended for commission members to approve the draft minutes from the April 11th and May 16th meetings. Since a quorum of members was not present, however, approval of the meeting minutes was postponed to the next meeting.

Co-chair Fargo then asked Co-Chair Baldwin to provide an update on planned/ongoing University of New Hampshire (UNH) activities relevant to the Commission. Co-chair Baldwin stated that UNH is involved with two grant proposals currently pending with the Department of Energy. The first proposal involves the creation of the New England Renewable Energy Consortium, a body comprised of academic institutions from New Hampshire, Massachusetts, Rhode Island and Connecticut. The Consortium was created in response to passage by Congress in December 2007 of the Energy Independence and Security Act of 2007. The Act requires that the Secretary of the Department of Energy award grants to institutions of higher learning (of consortia thereof) for the establishment of one or more National Marine Renewable Energy Research, Development, and Demonstration Centers. The Consortium is requesting \$1.4 million over a five year period. UNH's role in the Consortium would be to study and compare existing marine and hydrokinetic renewable energy technologies beneath the Little Bay and General Sullivan Bridges and offshore.

Co-chair Baldwin stated that UNH's second grant proposal with the Department of Energy is a 2-year collaborative effort with Lucid Technologies and Alden Laboratories to suspend a "Gorlov" Turbine from a small barge that would be attached/anchored to the General Sullivan Bridge.

Co-chair Fargo then reminded members that the Commission's final report to the legislature is due no later than November 1, 2008. He stated that the Permitting Requirements and the Environmental and Wildlife Impact Assessment chapters of the report are more or less complete. He then presented members with a "to do list" for completion of the remaining chapters of the report. The first item on the list identified the key sections of the Technical Feasibility, Cost & Benefits Analysis chapter, including, an estimate of harnessable power, a list of considerations for evaluating commercial and economic viability, and a discussion of whether the U.S. Coast Guard (USCG) would allow equipment (e.g., a tidal energy turbine) in the channel beneath the bridges. Co-chair Baldwin stated that he has nearly completed a report that provides an estimate of the harnessable power. Once complete, he wants to provide an opportunity for the Technical Feasibility, Cost & Benefits Analysis Subcommittee to review it before releasing it to the full Commission. He also stated that while the subcommittee has not put much effort into identifying the considerations for evaluating commercial and economic viability, this information should and would be included in the final report. Attendees discussed so-called "water-to-wire" efficiency and how run-of-river hydropower experiences might constrain the economic viability estimates. Chris Waszczuk of NHDOT stated that the section focusing on whether the USCG would allow equipment in the channel beneath the bridges should also discuss the need for NHDOT approval for any equipment attached to the bridges. According to Mr. Waszczuk, this issue was discussed during a meeting in June between NHDOT and Co-chair Baldwin. The NHDOT favored an independent anchoring system and is willing to work with the Consortium to include specifications for same in the construction contracts for the Little Bay Bridge upgrade. Mr. Waszczuk agreed to provide a copy of the minutes from the meeting to Co-chair Fargo.

Co-chair Fargo stated that he would continue to work with Evan Mulholland of the Attorney General's Office to provide updated information for the Legal Issues chapter of the report. He stated that Commission members Jack Pare and Justin Richardson, neither of whom were in attendance, had agreed to supplement the Legal Issues chapter by providing a summary of the activities of the two entities that currently hold Federal Energy Regulatory Commission preliminary hydrokinetic energy permits in the Piscataqua River.

Members then reviewed the Commission's three primary conclusions, as presented by Co-chair Fargo at the May 16, 2008 meeting (meeting minutes can be found on the commission's web page at: http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm . Vice-chair Diers recommended adding a fourth conclusion or preamble stating that the location beneath the Little Bay and General Sullivan Bridges is ideal because of the natural tidal restriction that exists there and because of the close proximity to the existing electrical grid and other infrastructure.

Co-chair Fargo noted that the activities of the Public and Business Community Outreach subcommittee have been on hold because of uncertainty in the type of tidal energy project that might move forward. Fargo stated that he would work with members of the

subcommittee (not present at the meeting) to outline a plan for a future outreach effort, for their chapter of the Commission's final report.

Co-chair Fargo then asked members for recommendations for further legislation. Vice-chair Diers stated that he would contact Mr. Mulholland regarding the topic of submerged lands leasing.

The next commission meeting was scheduled for **Friday, September 26, 2008 at 1:00 PM at the NH Department of Environmental Services Pease Office in Portsmouth. Members agreed to submit via email draft versions of the appropriate sections of the report to Co-chair Fargo by September 12, 2008.**

Meeting was adjourned at 2:40 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services
Pease Field Office, Portsmouth, NH
September 26, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ted Diers, Vice-Chair, NH Coastal Program
Nancy Borden, Public Appointee
Mike Johnson, National Marine Fisheries Service
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Cliff Sinnott, Rockingham Planning Commission
Eric Steltzer, NH Office of Energy & Planning
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

Christian Williams, NH Coastal Program

Summary:

Co-chair Fargo informed members that they had not yet formally approved the minutes from the April 11th, May 16th and August 8th meetings. He requested comments on the minutes from members. Chris Waszczuk inquired about changing the language of the Commission's first conclusion, as described on page 2 of the May 16th minutes. Specifically, he suggested changing the language from "...it is unlikely that a commercially viable power generation facility can be built beneath the Little Bay and General Sullivan bridges." to "...it remains questionable whether a commercially viable power generation facility can be built beneath the Little Bay and General Sullivan bridges." Members agreed to this change. Mr. Waszczuk then made a motion to approve the April 11th, May 16th (with the aforementioned change) and August 8th minutes. The motion was seconded and then unanimously approved by members. Chris Williams stated that final versions of the minutes would be posted in the near future on the Commission's web page. He also informed members that due to a recent overhaul of the Department of Environmental Services web site, the address of the Commission's web page had changed. The Commission's web page is now located at:
http://des.nh.gov/organization/divisions/water/wmb/coastal/ocean_policy/te_commission.htm.

Co-chair Fargo then presented attendees with a Draft Table of Contents for the Commission's Final Report (Report) to the legislature, which is due no later than November 1, 2008. The Table of Contents was comprised of the following sections:

Executive Summary

Section I: Introduction
Section II: Commission Meetings
Section III: Subcommittee Reports
Section IV: Legal Issues
Section V: UNH Tidal Energy Research Activities
Section VI: Conclusions
Section VII: Recommendations for Future Legislation
Appendices

Co-chair Fargo then reviewed the likely contents of each of the sections with attendees. Section II of the Report would include a compilation of all of the Commission's meeting minutes, while Section III would include the reports from each of the Commission's four subcommittees. He acknowledged that the Permitting Requirements Subcommittee report and the Wildlife and Environmental Impact Assessment Subcommittee report are more or less complete. Due to the absence of Ken Baldwin, Commission co-chair and chair of the Technical Feasibility, Cost & Benefit Analysis Subcommittee, co-chair Fargo was uncertain as to the status of the subcommittee's report. Regarding the Public and Business Community Outreach Subcommittee Report, co-chair Fargo stated that he'd contact subcommittee members and assist them, if needed, in the completion of the report.

Co-chair Fargo then reviewed the items that would comprise the Legal Issues section of the Report (Section IV). This section of the report would begin with a summary of the information provided by Evan Mulholland of the Attorney General's Office at the Commission's December 7, 2007 meeting, as well as follow-up information provided by Mr. Mulholland, including details of submerged lands leasing. Section IV would also include a summary of the activities to date of the two Federal Energy Regulatory Commission (FERC) preliminary permit holders, NH Tidal Energy Company and Underwater Electric Kite Corporation, for tidal energy projects in the Piscataqua River. Jack Pare stated that he is in the process of finalizing this information. Key issues regarding the existing FERC preliminary permits include whether they preclude UNH from installing a non-commercial, tidal energy test facility beneath the General Sullivan/Little Bay bridges and how they may affect NHDOT's existing right-of-way beneath the bridges. The final component of the Legal Issues section of the Report would include details of the U.S. Coast Guard's (USCG's) navigational requirements for the areas beneath General Sullivan/Little Bay bridges. Jack Pare, who is in the process of compiling this information, stated that while the USCG's controlling depth for the navigational channel beneath the bridges is 18 feet mllw (mean low low water), depths beneath the bridges approach 35 ft.

The next section of the Report (Section V) would focus on UNH's tidal energy research activities. Although UNH did not receive the two Department of Energy grants that it had recently applied for, co-chair Fargo stated that it is important to stress UNH's role in the development and implementation of tidal energy technologies. Included in this section would be a summary of the June 2008 meeting between NHDOT and

Commission co-chair Baldwin regarding UNH's efforts to install a non-commercial, tidal energy pilot facility beneath the General Sullivan/Little Bay bridges.

Co-chair Fargo then reviewed the Commission's three primary conclusions, as originally presented at the Commission's May 16, 2008 meeting. These conclusions would comprise Section VI of the Report.

Co-chair Fargo then asked attendees for recommendations for future legislation that would comprise the Report's final section (Section VII). Vice-chair Diers summarized his findings, based in part on discussions with Mr. Mulholland, regarding submerged lands leasing. Diers reviewed submerged lands legislation in Maine, New Jersey and Connecticut. It appears that the most feasible option would be to create a leasing program focused only on commercial, non-riparian activities within tidal waters. This would not apply to marinas, docks or fishing facilities. Maine uses the revenues from its submerged lands leasing program for various activities related to harbor management including its working waterfront initiative. The Commission members discussed whether the program would be extended into navigable waters and Great Ponds. The commission also discussed if the recommendation should extend to activities other than those that are energy related.

Jack Pare asked whether leasing issues associated with run-of-river facilities should be included with the discussion of tidal/hydrokinetic energy facilities. Diers suggested that the Report clearly define hydrokinetic energy.

Co-chair Fargo suggested the Commission might recommend legislation that would allocate a portion of NH's Renewable Energy Fund (REF), generated by the state's renewable portfolio standards (RSA 362-F), for hydrokinetic research. This program might follow the example of Rhode Island's program (<http://www.energy.ri.gov/programs/renewable.php>) that has funded two hydrokinetic feasibility studies. In passing HB 1628, the General Court recently authorized the allocation of up to 10% of NH's REF to provide rebates for installing small-scale renewable generation. A similar allocation might be made to fund hydrokinetic feasibility studies in New Hampshire.

Cliff Sinnott asked whether there was a need for an ongoing Tidal Energy Commission or Advisory Council. Diers indicated that the New Hampshire Coastal Program would be willing to convene annual meetings summarizing the status of offshore/tidal renewable energy issues.

The next commission meeting was scheduled for **Friday, October 24, 2008 at 1:00 PM at the NH Department of Environmental Services Pease Office in Portsmouth. Members agreed to submit via email draft versions of the appropriate sections of the Commission's Final Report to Co-chair Fargo by October 17, 2008.**

Meeting was adjourned at 3:00 PM

NH Tidal Energy Commission Meeting Minutes

NH Department of Environmental Services
Pease Field Office, Portsmouth, NH
October 24, 2008, 1:00 PM

Members:

Rep. Thomas Fargo, Co-Chair, City of Dover
Ken Baldwin, Co-Chair, UNH
Cynthia Copeland, NH Estuaries Project
Brian Giles, NH Estuaries Project
Rep. Roland Hofemann, Dover
Sean McDermott, National Marine Fisheries Service
Jack Pare, Town of Newington
Eric Steltzer, NH Office of Energy & Planning
Christopher Waszczuk, NH Department of Transportation

Other Attendees:

Christian Williams, NH Coastal Program

Summary:

Co-chair Fargo requested comments on the minutes from the September 26th meeting. No comments were provided. A motion was made to approve the minutes. The motion was seconded and then unanimously approved by members.

Co-chair Fargo then solicited comments on the Commission's draft final report. Comments focused primarily on the report's Executive Summary. Co-chair Fargo reminded attendees that the report and appendices are currently available for review on the NHDES Watershed Management FTP site. He asked attendees to provide him with comments on the draft final report and appendices as soon as possible. He reminded attendees that the Commission's final report is due on November 1, 2008.

Meeting was adjourned at 2:40 PM.

Appendix 3:

NH Tidal Energy Commission Subcommittee Membership

Permitting Requirements Subcommittee

* Chris Williams
Ken Baldwin
Ted Diers
Sean McDermott
Jack Pare
Jack Ruderman
Chris Waszczuk
Craig Yankes

Public and Business Community Outreach Subcommittee

* Kathleen Lewis
Erik Anderson
Ken Baldwin
Cynthia Copeland
Rep. Roland Hofemann
Eric Steltzer

Environmental and Wildlife Impact Assessment Subcommittee

* Sean McDermott
Ken Baldwin
David Funk
Dave Kellam
Rep. Marcia Moody
Peter Wellenberger

Technical Feasibility, Cost & Benefits Analysis Subcommittee

* Ken Baldwin
Nancy Borden
Brian Giles
Mike Harrington
Jack Pare
Otis Perry

* - indicates Subcommittee Chairperson

Appendix 4:

NH Tidal Energy Commission

Links to Pertinent Sites and Information

Oceana Energy Company <http://www.oceanaenergy.com>

Underwater Electric Kite Corporation: <http://www.uekus.com>

Who Owns River Power? The Boston Globe, October 18, 2007
http://www.boston.com/news/local/articles/2007/10/18/q_who_owns_river_power/?page=full

Tidal Energy Turf War, New Hampshire Public Radio, July 16, 2007
<http://www.nhpr.org/node/13473>

Tapping the Energy of the Tides, New Hampshire Public Radio, July 13, 2007
<http://www.nhpr.org/node/13455>

New Hampshire HB 694 Passes Senate Committee, Seacoast NRG, May 19, 2007
<http://www.seacoastnrg.org/2007/05/19/nh-hb-694-passes-senate-committee/>

New Hampshire HB 694: Tidal Power for the Seacoast? Seacoast NRG, February 24, 2007
<http://www.seacoastnrg.org/2007/02/24/nh-hb-694-tidal-power-for-the-seacoast/>

East River Fights Bid to Harness Its Currents for Electricity, The New York Times, April 13, 2007
<http://www.nytimes.com/2007/08/13/nyregion/13power.html?ei=5090&en=5afc978933470d77&ex=1344657600&partner=rssuserland&emc=rss&pagewanted=all>

Appendix 5: NH Tidal Energy Commission Summary of FERC Preliminary Permit Holders' Activities

Commercial Tidal Power Vendor Activities

Efforts to establish this Tidal Commission began in December, 2006. On June 25, 2007 Governor Lynch signed HB 694 enabling this NH Tidal Energy Commission. Prior to June two commercial tidal power vendors were surveying the Piscataqua River in preparation for applying to the Federal Energy Regulatory Commission (FERC) for preliminary permits to study the feasibility of developing tidal power projects in the Piscataqua River.

In the words of FERC:

The purpose of a preliminary permit is to preserve the right of the permit holder to have the first priority in applying for a license for the project that is being studied. Because a permit is issued only to allow the permit holder to investigate the feasibility of a project while the permittee conducts investigations and secures necessary data to determine the feasibility of the proposed project and to prepare a license application, it grants no land-disturbing or other property rights. As noted, a preliminary permit does not authorize a permittee to undertake any construction or to enter onto lands owned by others.

The purpose of a preliminary permit is to encourage hydroelectric development by affording its holder priority of application (i.e., guaranteed first-to-file status) with respect to the filing of development applications for the affected site.

These two FERC applicants are:

New Hampshire Tidal Energy Company (Oceana Energy)
Underwater Electric Kite Co

On March 28, 2006 the New Hampshire Tidal Energy Company (NHTEC), a wholly owned subsidiary of Oceana Energy Company, applied for a preliminary permit from FERC.

After some wrangling over possible competition from the Underwater Electric Kite Co (UEK – discussed below), FERC issued a preliminary permit to *both* applicants on April 16, 2007. In approving both preliminary applications FERC said it would be

“adopting in the interim a “strict scrutiny” approach. Under that approach, the Commission will process new technology preliminary permit applications with a view toward *limiting the boundaries of the*

permits to prevent site-banking and to promote competition. Further, to ensure that permit holders are actively pursuing project exploration, the Commission will carefully scrutinize the reports that permit holders are required to file on a semi-annual basis, and would, where sufficient progress was not shown, consider canceling the permit. Stricter scrutiny could entail requirements such as reports on public outreach and agency consultation, development of study plans, and deadlines for filing a Notice of Intent to file a license application and a Pre-Application Document.

“Under the interim policy, this permit will include conditions to closely monitor the progress of the permittee’s activities. In addition to the six-month progress reports required of permittees, this permit will also require the permittee to file, within 45 days of the issuance date, a schedule of activities to be carried out under the permit and target dates for completion of these activities. ... If the periodic progress reports required by Article 4 of this permit do not show significant progress, or if the permittee fails to comply with any other conditions, the permit may be cancelled.

That same day, Oceana issued a press release stating that it received a preliminary permit from FERC to study the feasibility of developing a tidal power project in the Piscataqua River along the Maine-New Hampshire border. Entitled the Portsmouth Area Tidal Energy Project - this represented the sixth permit awarded by FERC to Oceana companies as of April 16, with six other permits pending before the Federal Energy Regulatory Commission.

Oceana's seven subsidiaries and their 12 associated projects, as of April 2008, are as follows. The FERC Preliminary Docket Numbers are shown.:

Alaska Tidal Energy Company

Kachemak Bay Tidal Energy Project - Docket Link>> P-12694

Icy Passage Tidal Energy Project - Docket Link>> P-12695

Gastineau Channel Tidal Energy Project - Docket Link>> P-12696

Wrangell Narrows Tidal Energy Project - Docket Link>> P-12697

Central Cook Inlet Tidal Energy Project - Docket Link>> P-12705

Golden Gate Energy Company

San Francisco Bay Tidal Energy Project - Docket Link>> P-12585

Maine Tidal Energy Company

Kennebec Tidal Energy Project - Docket Link>> P-12666

Penobscot Tidal Energy Project - Docket Link>> P-12668

Massachusetts Tidal Energy Company

Cape and Islands Tidal Energy Project - Docket Link>> P-12670

New Hampshire Tidal Energy Company

Portsmouth Area Tidal Energy Project - Docket Link>> P-12664

New York Tidal Energy Company

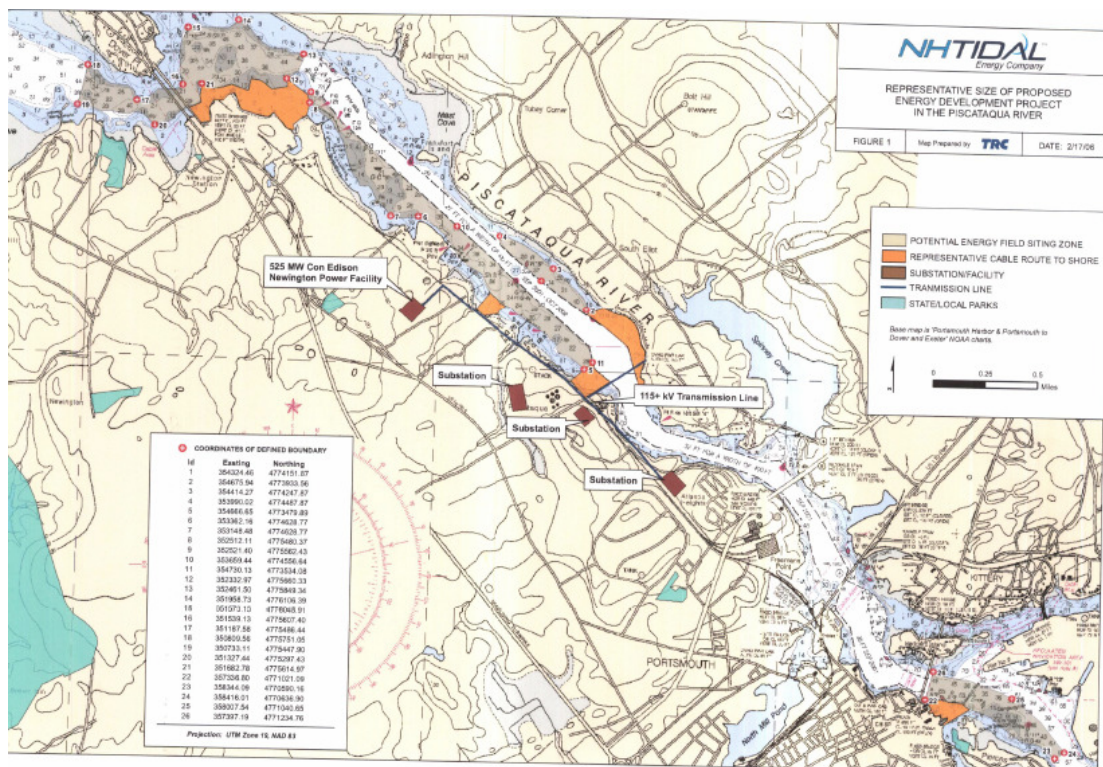
Astoria Tidal Energy Project - Docket Link>> P-12665

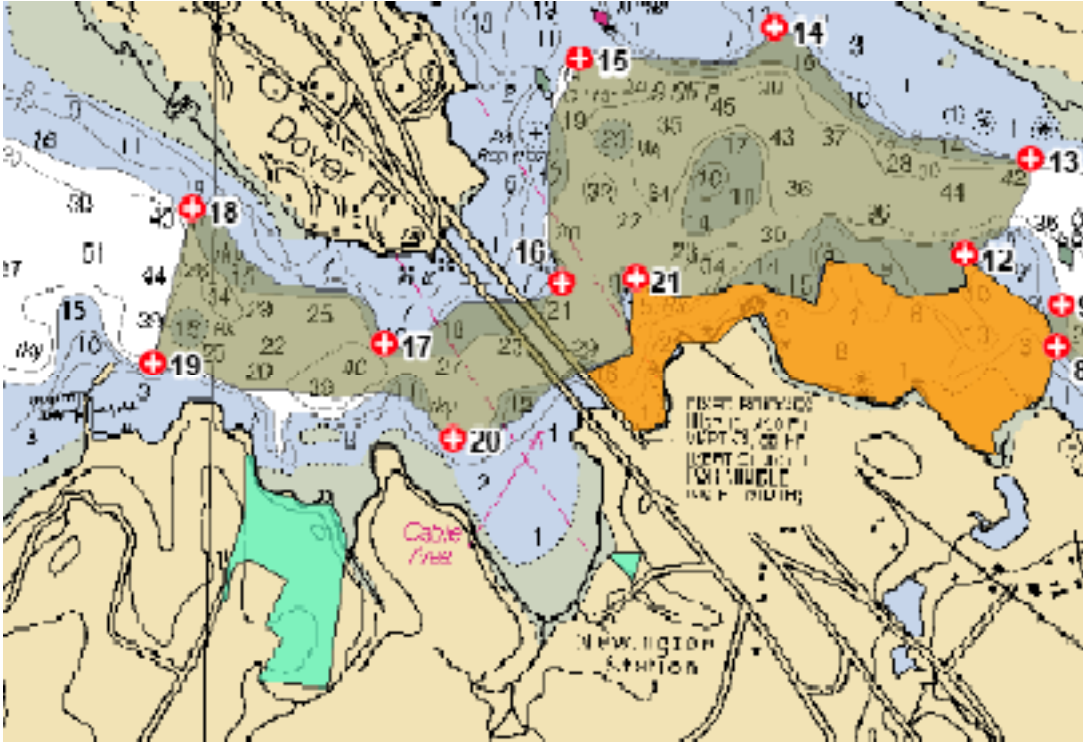
Oregon Tidal Energy Company

Columbia Tidal Energy Project - Docket Link>> P-12672

Specific Details of FERC Application - docket # P-12264-000

The Portsmouth Area application was for four permit areas shown in grey in the map below. The first area begins west of Dover Point, under the Little Bay Bridges, to the point off Sprague Energy's Axel Johnson Conference Center. A portion of this area near the bridges may have a potential to conflict with the efforts of this Commission. This first permit area is enlarged in the second map. The second area lies directly between the commercial ship channel and the commercial docks along the shore in Newington. Much of this area is likely to be challenged by the town as an intervener in the FERC permitting process. Dover has also filed to intervene. The third area is outside the ship channel along the South Eliot and Kittery shore below the marina and launching ramp. The Maine's State Planning Office filed with FERC as an intervener representing Eliot & Kittery. The fourth is between the center of the river below the Memorial Bridge and the Portsmouth shoreline – in NH waters only, thus avoiding conflicts with the Navy Yard. This area is in way of the channel to the commercial fishing docks and recreational piers at Prescott Park.. Portsmouth has also filed for intervener status.





The application provided inexact descriptions of the technology(ies) to be evaluated and numbers to be deployed. It describes the equipment as 50 to 100 Tidal In Stream Conversion (TISEC) devices. Each is to be 20 to 50 ft diameter and generate a peak power of 500 kilowatts to 2 megawatts. These devices are claimed to be above the industry average in efficiency – claiming an 80 percent capacity factor.

The vagaries of the technology and the number of Oceana sites has prompted the Boston Globe to write:

Oceana has seven subsidiaries interested in hydropower projects in 12 locations in this country using a device still very much in the development stages, according to the company's website and interviews with its officers.

The multiple locations Oceana is looking at and the lack of a turbine ready to deploy has led some to charge the company with site-banking: acquiring rights to mine energy from powerful waters and then selling those rights when a feasible plan is proposed. In addition to New Hampshire, Oceana has set up tidal energy subsidiaries in Massachusetts, Maine, Alaska, New York, and Oregon.

**Who Owns River Power, The Boston Globe, October 18, 2007
(Appendix 4)**

Local Government Reactions

The local Towns, Cities and Organizations are, so far, in favor of the concept of this renewable energy proposal for the seacoast region. However, all have filed to legally intervene to maintain a legal standing in the FERC application process. Interveners in the NH Tidal Electric Corp's application to FERC include:

Town of Newington
City of Dover
City of Portsmouth
Rockingham Planning Commission
University of New Hampshire
Free Flow Power
Maine's State Planning Office (representing Elliott & Kittery)
Public Service of New Hampshire
US Department of the Interior
National Marine Fisheries Services
Verdant Power

Some of the reasons for intervention include (more might emerge):

Industrial Shoreline Access

The claimed area on their FERC application appears to impede deep water access to a significant portion of Newington's industrial piers and waterfront (representing the majority of New Hampshire's current and future deep water shipping capacity).

Conflict with Bridges

The northernmost portion of the Energy Field Siting Zones includes the Little Bay Bridge area between Newington and Dover. The Portsmouth Zone also encumbers one side of the Route 1 Memorial Bridge. These claim areas around the NH DOT bridges do not leave room to anchor barges for bridge construction/maintenance.

Limit boundaries

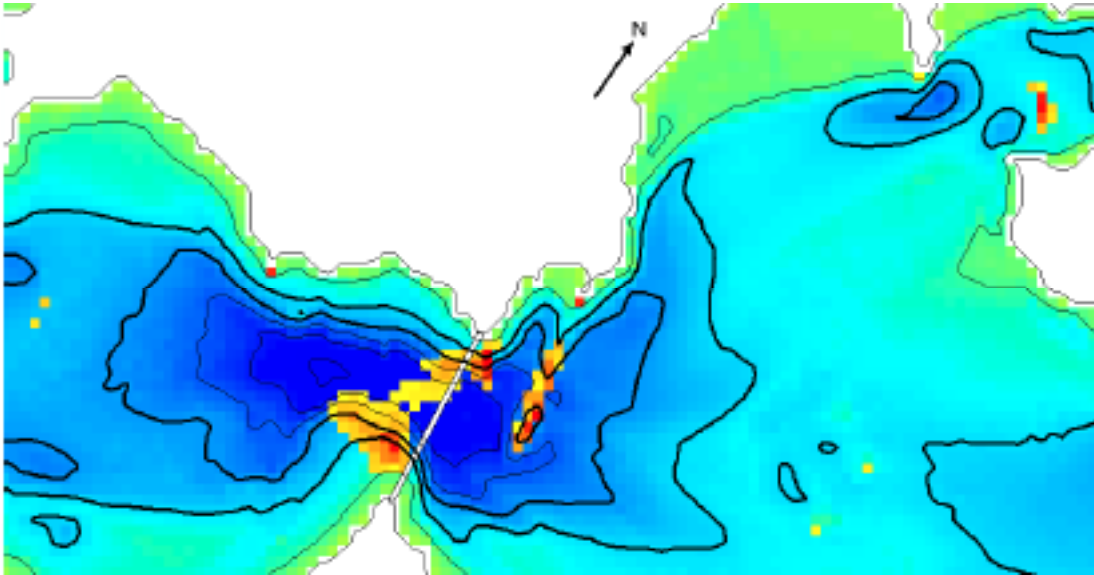
FERC has stated it will be “adopting in the interim a ‘strict scrutiny’ approach (with a) view toward *limiting the boundaries of the permits to prevent site-banking and to promote competition*. Any area within 600 feet of bridges owned by NH may be more appropriate for technologies patented by other tidal energy developers.

Cancel permit due to inaction

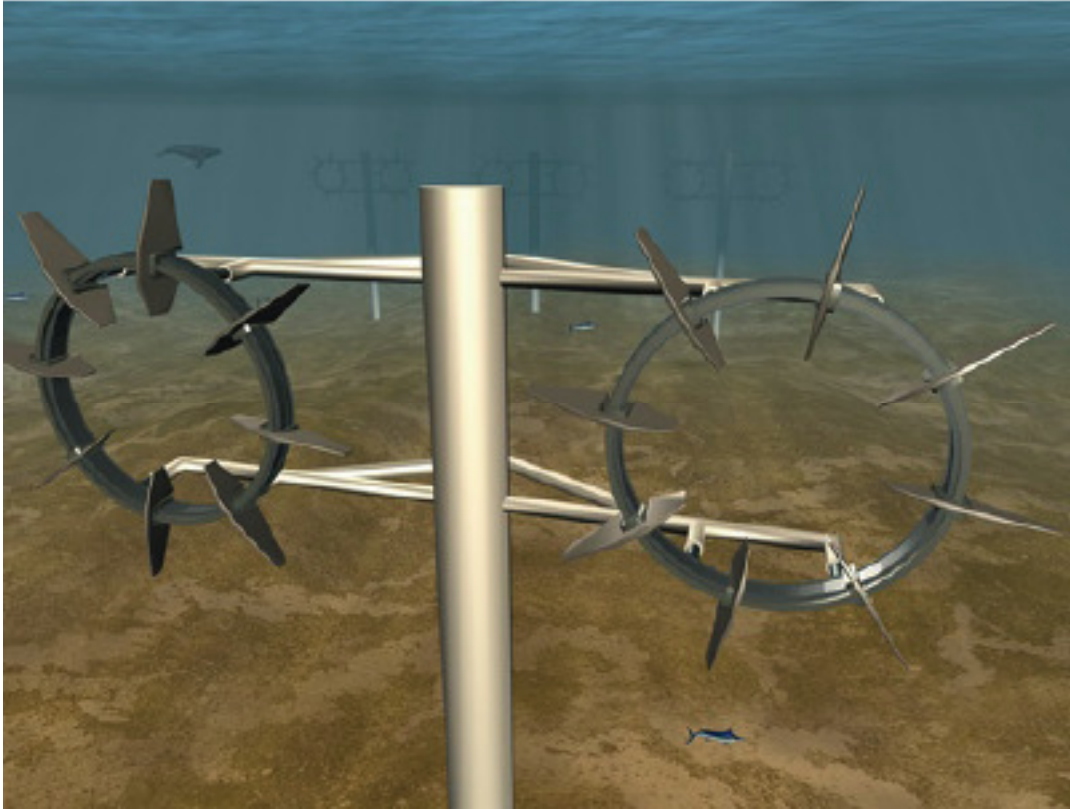
Some interveners are informally discussing requesting FERC to cancel NHTEC’s permit , due to not successfully carrying out required and scheduled activities – including superficial six-month progress reports and reports on public outreach; only one agency consultation and (so far) lack of development of study plans; and (so far) meeting deadlines for filing a Notice of Intent to file a license application and a Pre-Application Document

NHTEC meeting with Commission

Both FERC applicants were requested to meet with this Tidal Energy Commission. On January 18, 2008 NHTEC made a presentation to this Commission. Discussions of the Preliminary Permit showed claimed areas for exploration remain as shown on the application, with no reduction. They also presented overview ACDP 'pictures' of currents near the Little Bay Bridges made by Free Flow Energy.



The elusive TISEC technology was shown as conceptual pictures, but no dimensions were given and none were photographs. The below TISEC device is described as having a circular track with hydro blades mounted to trolleys, powering a linear induction generator.



A single rotor version is planned as a pilot project under a barge (no timeframe or location given). The mounting will be on rails behind the barge, so it may be raised and lowered.

Several members of this Commission observed that this rotor system may be more successful as a deep ocean current device, rather than one deployed in a tidal river estuary. The device employs exposed blades radiating outward beyond the circular linear induction track. The circular track and linear induction generator appear to share the technology (if not the components) of an open center ducted turbine by OpenHydro, an Irish company (OpenHydro.com); but do not benefit from the shielding of a surrounding duct. When not surrounded by a substantial housing – including blade guards - exposed rotating blades in the Piscataqua will be hit with floating debris ranging from clumps of eelgrass to partially submerged tree trunks. The article in Appendix 4 named **East River Fights Bid to Harness Its Currents for Electricity, The New York Times, April 13, 2007** shows this difficulty with the exposed turbine blades of Verdant Power’s tidal generators in New York’s East River estuary.

According to the parent Oceana Energy Company’s website, “New Hampshire Tidal will now start a three-year sequence of activities that includes physical investigations of the site, technological compatibility assessments, resource evaluations, and stakeholder interactions. The company will decide whether to proceed with the submission of a license application that would authorize construction of a tidal power project based on the collected information.”

Other NHTEC Activities

As of June 29, 2008 Oceana has surrendered three FERC Permits in the Pacific Northwest due to environmental, use-conflict and commercial feasibility constraints and has removed the **Oregon Tidal Energy Company** from its listed subsidiaries.

In 2006 several vendors entered into a Cooperative Research & Development Agreement (CRADA) with the U.S. Navy to utilize its Naval Surface Warfare Center, Carderock Division's engineering facilities and expertise to develop and test various power generation platforms. Oceana offered its Tidal Defense and Energy System (TIDES)TM. This US Navy arrangement with the vendors is continuing and will extend through to the completion of the design and delivery of at least one large-scale beta demonstration device. NHTEC did not make any relationship between the TIDES demonstration device to what was presented, nor was it mentioned to this Commission.

Underwater Electric Kite

UEK of Annapolis, Maryland

UEK initially filed a "competitive" preliminary application with FERC on July 3, 2006 under the name of the "Piscataqua Tidal Hydrokinetic Energy Project" and FERC Project No. 12722-000. The FERC staff determined that the UEK application was not for the same areas of the river and accepted the application as non-competing on July 31, 2006.

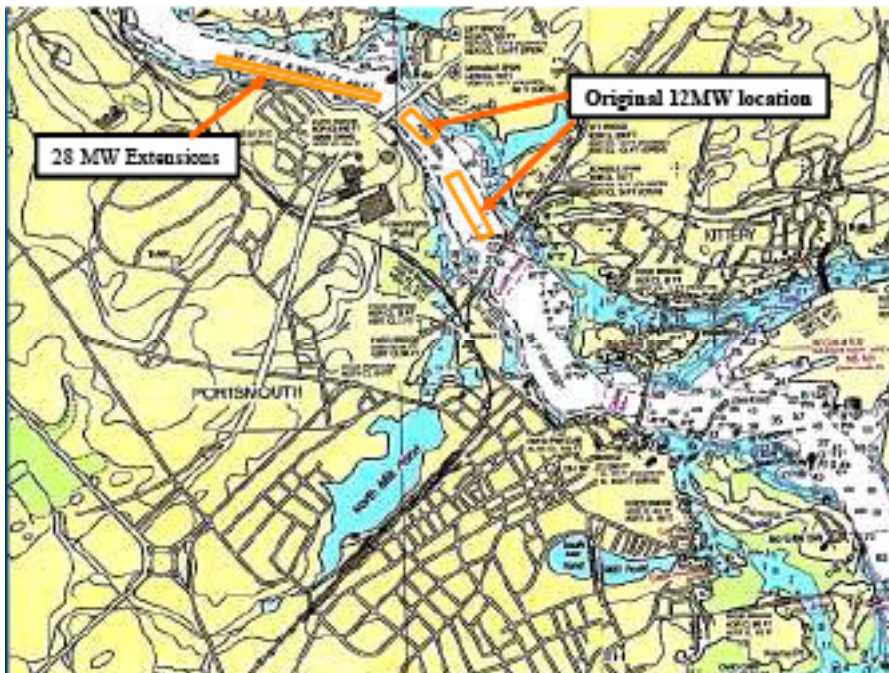
NHTEC argued against FERC accepting the UEK application because "the Piscataqua River has a finite amount of tidal energy available for extraction, the geographic overlap of the competing applications represents developmental competition from technical and scientific standpoints."

FERC ruled that "the project boundaries do not overlap or conflict, and are in distinctly separate locations. NHTEC's assertion that the two proposed projects would compete operationally because of the 'finite amount of tidal energy available for extraction' is unsupported with any specific data and fails in any meaningful way to show that the two proposed projects would conflict with one another operationally, much less geographically." FERC approved *BOTH* the preliminary applications of UEK and NHTEC on April 16, 2007

Specific Details of FERC Application - docket # P-12722-000

The UEK application is for two permit areas – an initial 12 megawatt area and a 28 megawatt follow-on area. The initial 12 megawatt area lies mid-channel in the river between the Interstate 95 high bridge and the Sarah Long Route 1 bypass bridge. While there is sufficient depth for devices to be placed below the controlling depth for the shipping channel, the proposed semi-buoyant turbine units rely on a surface buoy to hold them at depth and to aid retrieval. If the USCG permits the generation units to be placed under the channel, the surface buoys would likely not be allowed.

UEK's proposed 28 MW extension area is planned for the "gorge" below Atlantic Heights, just inland of the Interstate 95 high bridge, between the shipping channel and the cliffs. Here, the surface buoys should not be an issue with the USCG, as they would not be in the channel. However, small surface buoys may be vulnerable to moving ice in the spring, and to boat collisions year-round.



UEK proposed"

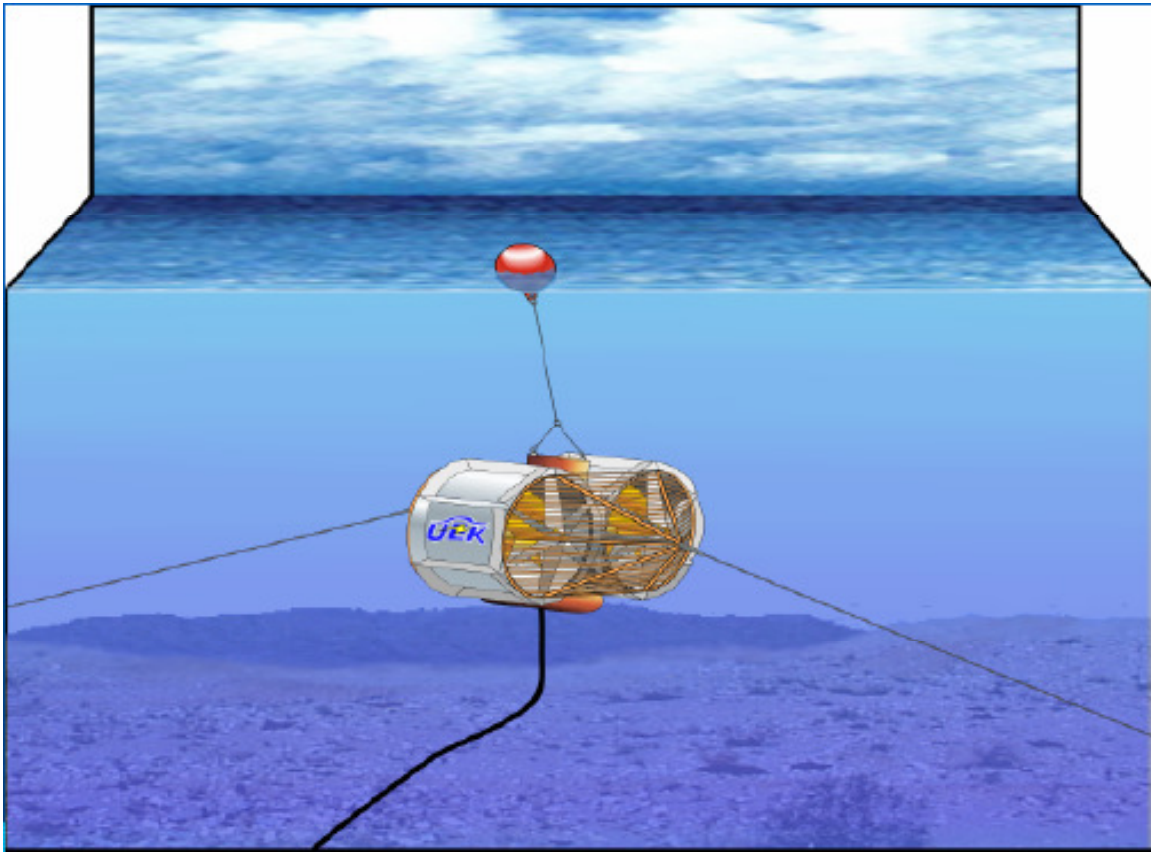
The proposed project would consist of up to 120 Underwater Electric Kite[®] units, also known as bi-directional hydro turbine assemblies for tidal development, having a total installed capacity of 40 Megawatts (MW). Each unit consists of two horizontal axis turbines 17 feet in diameter, 32 feet-wide, and 20 feet-long, integrated generators with a capacity of 336.8 kW each, biological protection screens and deterrent systems, anchoring systems, and mooring lines. The proposed project would include a proposed underwater high voltage direct current (HVDC) transmission line, and appurtenant facilities. The project is estimated to have an annual generation of 221.8 gigawatt-hours annually, which would be sold to a local utility

UEK has proposed a capacity factor of 64 percent, which is a very believable efficiency for tidal generation - versus NHTEC's claim of 80 percent.

The proposed UEK Turbine Unit

The UEK bi-directional hydro turbine assemblies are essentially the two side-by-side single-direction turbine assemblies (that UEK has been deploying in streams and rivers

since 1981) with a new two-directional housing to adapt it for tidal use. The single-direction in-stream unit was tethered by one cable and allowed to swing to face a changing current direction. The tidal bi-directional hydro turbine assemblies are moored with cables at each end, so the unit cannot pivot with a change in tide direction. This requires long cables reaching upstream and downstream to hold each unit steady.



The turbines each operate at 42 RPM under full load and the single-direction river version turbine units have been tested and found to be ‘fish friendly’. The external shield on the bi-directional unit has upgraded wildlife screens on both ends.

Other Terms in the FERC Preliminary Permit

The terms of the UEK Preliminary Permit are identical to those issued to NHTEC. Both allow 36 months starting May 1, 2007. Both require six-month progress reports and within 45 days submit a “schedule of activities proposed by the permittee during the three-year permit term, leading to the filing of a development application”. Additionally, both vendors are required within one year to file a Notice of Intent (NOI) to apply for a Developmental License and issue a Pre-Application Document (PAD), and (optionally) a notification whether the permittee chooses to apply via the Traditional Licensing Process or Alternative Licensing Process. The approval document stated:

The PAD shall include a time frame for consulting with federal, state, and local agencies, tribes, non-governmental organizations, and any other

interested entities; and for developing and filing a preliminary list of issues identified and studies related to these issues needed to develop a license application.

While both vendors have submitted their six-month progress reports and their three-year schedules; neither vendor has submitted a NOI or PAD. These should have been due in May, 2008.

Local Government Reactions

As with NHTEC, the local Towns, Cities and Organizations are, so far, in favor with the concept of this project. Reactions were a little more favorable than for NHTEC in that UEK unambiguously described its technology; had previously deployed similar devices; and the size of the energy fields to be prospected are significantly smaller. Again some localities filed to intervene in the FERC licensing process to preserve their future legal standing. Motions to intervene were filed by:

- Rockingham Planning Commission
- New Hampshire Coastal Program
- Maine State Planning Office (representing Eliot & Kittery)
- City of Portsmouth
- University of New Hampshire
- NHTEC

There were fewer objections expressed by the interveners with UEK than there were with the NHTEC application. The interveners simply wanted to maintain a legal standing in the FERC application process.

Issues Common to Both

If both the UEK and NHTEC proposals become fully constructed, the only stretch of river between Portsmouth and Dover Point without underwater obstructions would be the channel area between the Sarah Long Bridge and the Memorial Bridge. The underwater generation equipment would make the majority remaining areas incompatible with sport fishing (trolling) and would make deploying and retrieving lobster gear difficult. Both vendors need to resolve these issues during the mandatory public outreach required by FERC.

UEK meeting with Commission

Both FERC applicants were requested to meet with this Tidal Energy Commission. UEK met with the Commission on February 15, 2008. The claimed exploration areas remained the same, but UEK presented maps that were much more clear than those filed with the FERC application. UEK also proposed that its Piscataqua River project would be the first cost-effective tidal energy project in the United States.

UEK's proposed action is to begin a pilot project of unspecified duration in their original 12 MW peak capacity area in the two mapped locations between the Sarah Long Bridge and the Interstate 95 high bridge. The first step is a planned 90-day monitoring of the site, then operate a pilot unit mounted to a catamaran barge within the areas noted above. Testing of the prototype is planned to yield the information wanted by the various stakeholders and licensing agencies.

UEK is planning upon an Environmental Assessment, not a full Impact Study (which may be overly optimistic). After this indefinite length pilot project (which may not last longer than the 3-year preliminary permit), UEK would apply to FERC for a developmental license (which offers exclusive development rights for another 5 year duration).

Recent projects

UEK has been putting turbines in the water since at least 2003. Some notable more recent projects of significance are:

Minas Basin, Nova Scotia Department of Energy

Minas Basin Hub – Announced Jan 2008 as one of three vendors to be evaluated in the Bay of Fundy at the Minas Basin in-stream tidal technology centre. Nova Scotia has a target of 20 percent renewable power by 2013.

Alliance Energy Company /UEK

Ogdensburg, St. Lawrence River Project on the American side, 5 miles upstream and downstream of the Ogdensburg-Prescott International Bridge. FERC preliminary permit is under review since August, 2007. The proposal is for similar-sized turbines that are planned for the Piscataqua.

Alaska Power and Telephone Company /UEK

Eagle, Yukon River Tidal Energy Project – FERC Permit No. 1-2002-0658

Issued Jan 23, 2003 A run-of-the-river project on the Yukon River.

Appendix 6:

NH Public Utilities Commission Administrative Rules for Renewable Energy Fund

Puc 2500 NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

PART Puc 2507 RENEWABLE ENERGY FUND

Puc 2507.01 Source of Fund. All alternative compliance payments deposited pursuant to Puc 2503.02 with the state treasurer shall be held in a nonlapsing account to be known as the renewable energy fund. The commission shall account separately for alternative compliance payments received in connection with Class II certificate acquisition obligations.

Source. #9169, eff 6-3-08

Puc 2507.02 Annual Report of Fund.

(a) On September 1 of each year, the commission shall publish on its web site a report of the renewable energy fund including:

- (1) Class II alternative compliance payments received in the calendar year;
- (2) Class I, III and IV alternative compliance payments received in the calendar year;
- (3) An estimate of the Class II amounts in the alternative compliance fund available to support new solar energy technology initiatives; and
- (4) An estimate of Class I, III and IV amounts in the alternative compliance fund available to support other thermal and electrical renewable energy initiatives.

Source. #9169, eff 6-3-08

Puc 2507.03 Renewable Energy Initiatives.

(a) The commission shall periodically issue a request for proposals for initiatives to be supported by the renewable energy fund. All such initiatives shall be located in New Hampshire.

(b) In determining whether and to what extent it will dedicate money from the renewable energy fund to proposals submitted pursuant to (a) above, the commission shall consider the extent to which:

- (1) The initiative is likely to expand or support the production capacity of renewable energy facilities located in New Hampshire;
- (2) The initiative is likely to be cost-effective;
- (3) The initiative promotes market transformation, innovation, and energy cost savings;
- (4) The initiative will reduce New Hampshire's peak load as well as defer or eliminate local utility distribution plant expenditures;
- (5) The initiative is likely to result in economic development and environmental benefits for New Hampshire;

- (6) The initiative increases fuel diversity in the production of electricity or thermal energy for consumption in New Hampshire; and
 - (7) The applicant has the capacity to successfully complete the initiative and the significance of the proposed assistance of the renewable energy fund in the viability of the project.
- (c) The commission on its own motion shall dedicate funds for those initiatives that it finds are:
- (1) Substantially consistent with the factors set forth in (b) above;
 - (2) Realistically proposed and achievable by the applicant; and
 - (3) Most likely, on balance, to advance the purposes of RSA 362-F, within the constraint of available funds.
- (d) The commission shall allocate all Class II alternative compliance payments into the renewable energy fund, on an annual basis, to projects and initiatives that support eligible solar technologies.
- (e) The commission shall allocate not less than 20 percent of Class I, II, III and IV alternative compliance payments received on an annual basis to customer-sited thermal and renewable energy projects of up to 100 kilowatts in gross nameplate capacity or the equivalent thermal output provided that such customer-sited projects meet the requirements of Puc 2507.04.
- (f) The commission on its own motion and after notice and hearing shall establish a rebate program for customer-sited renewable energy projects of up to 100 kilowatts or equivalent thermal output, to be supported by the fund allocated pursuant to (e) above.

Source. #9169, eff 6-3-08

Puc 2507.04 Customer-Sited Projects.

- (a) The provisions of this part shall apply to customer-sited generation of up to 100 kW in gross nameplate capacity or equivalent thermal output.
- (b) Persons seeking funds for customer-sited projects from the renewable energy fund shall apply according to this section.
- (c) An applicant shall be:
- (1) A residential, commercial, industrial, institutional, or public entity in New Hampshire;
 - (2) An end use customer of provider of electricity located in New Hampshire; and
 - (3) The owner of the proposed project.
- (d) Applications pursuant to this part shall include the following information:
- (1) The name, address and telephone number of the applicant;
 - (2) The location of the proposed project;
 - (3) The name and address of the monitor who will verify installation and production;
 - (4) The type of technology used in the proposed project; and
 - (5) The nameplate capacity of the proposed project.
- (e) Applications shall include a signed contract with a primary installer or vendor that provides customers with a turnkey service.

(f) If the applicant intends to install the project, the applicant shall apply for a waiver from (e) above.

(g) The commission shall notify an applicant by letter if his or her proposal is accepted for funding from the renewable energy fund, including the amount, in dollars, that may be provided through the renewable energy fund.

(h) Prior to receiving any monies from the renewable energy fund, the applicant shall demonstrate that the project is installed and operating by providing an attestation by a monitor or a distribution company that states:

(1) The project is installed and operating in conformance with applicable codes, including applicable safety, zoning and building codes and has received any required inspections;

(2) The interconnection between the project and the distribution utility complies with the applicable interconnection, testing, and operational requirements, though not necessarily the net metering requirements, of Puc 900, "Net Metering for Customer-Owned Renewable Energy Generation Resources," or in the alternative, Puc 307.06; and

(3) The monitor or distribution utility has inspected the installation.

(i) Upon demonstration that the project is installed and operating, the commission shall provide the state treasurer information regarding:

(1) The name and address of the recipient of the money; and

(2) The amount of money to be disbursed to the recipient pursuant to (i) above.

Source. #9169, eff 6-3-08

Puc 2507.05 Audit. A recipient of any monies disbursed from the renewable energy fund shall make its books, records and facilities available to the commission for the purpose of allowing the commission to discharge its audit responsibilities pursuant to RSA 362-F:10, I.

Source. #9169, eff 6-3-08